

**Thorbjørn Jagland:**

The Secretary-General of the Council of Europe reflects on the migration crisis

**Vytenis Andriukaitis:**

The EU's health commissioner on the UK's vote to leave the European Union

**Georges Dassis:**

The President of the EESC discusses the democratic challenge facing Europe

Pan European
Networks**Government**

BREXIT

Can Brussels survive the seismic shock of the UK's decision to leave the European Union?

Supported by:

CMS
Clever Marine Services

in association with:

COUNCIL OF EUROPE



CONSEIL DE L'EUROPE

AS24

The largest station network dedicated to trucks

 764 fully automatic stations ▼

 586 Adblue® stations ▼

 20 European toll systems ▼

IRELAND
18
STATIONS

U.K.
51
STATIONS

 13,000 ▲ partner stations



DOWNLOAD YOUR AS24 DRIVER AND FLEET MANAGER APPS ▼



PASSango
...pilot



 Geolocalise your fleet in real time

-  EASY AND FAST PASSAGE AT TOLLS
-  SECURED SERVICES
-  GUARANTEED ACCESS TO DISCOUNTS
-  REMOTE BOX CUSTOMISATION





Thorbjørn Jagland

Secretary General
Council of Europe

The refugee crisis has exposed cracks in European co-operation. Solidarity has been in short supply and a minority of countries, including Greece and Turkey, continue to bear a disproportionate burden. While the EU/Turkey deal does now appear to be having a positive impact on numbers, there is still no clear strategy for relocating the hundreds of thousands of refugees who have already arrived. Most troubling of all has been the emergence of legislative nationalism. By this I mean governments acting unilaterally, at times with little regard for international law, with the aim of tightening their borders.

What does this tell us about Europe? Should we treat this crisis – as sceptics suggest – as a nail in the coffin of continental co-operation?

In my view this is entirely the wrong conclusion to draw. The sight of thousands of volunteers giving up their money, time and even rooms in their homes to help strangers fleeing conflict testifies to the generosity that lives in our societies. And can anyone seriously suggest that what is needed now is less co-operation? On the contrary, the lesson is one we already know: that in insecure and chaotic moments, our nations are always best when they seek common solutions based on shared values and grounded in law. Our challenge is reviving this approach in the coming months and years.

In addition to effective relocation, joint action will be required on three key fronts.

First, all European nations have a moral and legal duty to ensure that the human rights of newcomers are upheld. The European Convention on Human Rights and the case law of the Strasbourg Court set out clearly the treatment all migrants and asylum seekers should expect. No pushbacks or collective expulsions at the border, for example. No discrimination based on race or religion. No physical restraint or inappropriate and unnecessary body searches. If a state must detain someone, it must be an exceptional measure, carried out in accordance with a precise law. Asylum applications must be considered on a

case-by-case basis and applicants have a right to legal advice and information in a language they understand. All states have an obligation to prevent refoulement. You cannot lawfully expel someone who faces potential torture, ill-treatment or death if they return to their home country. Nor can you send them somewhere else if there is a reasonable danger that they will be sent back into harm's way.

Second, special attention must be paid to the plight of child refugees. Last year, an estimated 300,000 migrant and asylum-seeking children entered Europe, many of them unaccompanied. These children are at grave risk of sexual exploitation and abuse. They face the very real danger of passing from the hands of smugglers into those of traffickers. It is therefore essential that national authorities provide safe, secure and suitable accommodation and assign these children appropriate legal guardians. The Council of Europe is urgently monitoring the situation in order to provide a clearer picture of it, which may be worse than we fear.

Third, integration cannot wait – particularly at a time when xenophobia and populism are on the rise across the continent. Refugees and immigrants are easy targets and convenient scapegoats for a society's problems. More than ever responsible politicians must take a zero-tolerance approach to discrimination and hate speech, being loud and unequivocal about the benefits that refugees can bring to our societies. It is in the clear interest of cohesion to ensure that newcomers can work and contribute without delay. To this end the Council of Europe is assisting our member states in easing the process by which refugees' professional qualifications are recognised.

It is not too late for a concerted European response. With enough leadership Europe can resolve this crisis through its finest traditions of collaboration and principled joint action. The Council of Europe will continue to support these efforts in any way we can – for the sake of the many refugees who desperately need our help. And for the sake of the values and co-operation on which a strong and safe Europe depends.

Michael Brennan

Editor

Pan European Networks: Government

ON 23 June, the UK voted to leave the European Union. An historic moment in European affairs, the result of the referendum threw UK politics into disarray, sent reverberations across the global economy and led to much soul searching amongst the European political elite. For now the UK remains a member of the union and London has not moved to initiate the formal exit negotiations under Article 50 of the Treaty of Lisbon. In the wake of the referendum, this edition opens with a special feature that explores some initial responses to the result. With political reaction and consideration of the impacts on key issues such as scientific research funding, alongside reflection on the outlook for democracy in the EU and the European role in the world – this special brings together key voices on the core issues.

In this age of great technological change, digital innovation continues to bring disruption to financial services. From blockchain technology to digital payments and new financial services, the sector is contemplating the implications of such developments. A special feature on financial innovation gathers commentary from the European Digital Currency & Blockchain Technology Forum, MasterCard, the European Banking Association and the Financial Services Club.

Digital innovation is changing not just the financial sector, but the very urban areas in which we live. Thus in the smart city section, a number of articles are devoted to changes taking place in the built environment. While there is great excitement around new technologies and economic progress, ensuring environmental sustainability is self-evident. As ever, we pick up on a number of topical trends in our environment section, which has a focus on hydrological matters and coverage of this year's edition of European Green Week, as well as reflection on some of the efforts NGOs are embarking on to protect biodiversity. Climate matters are covered in a special focus which includes interviews with Norway's



minister of petroleum and energy, Tord Lien, and the director general of DG Climate, Jos Delbeke.

The transport section sees our coverage of clean road transport developments continue and features key reportage from the TRA2016 conference earlier this year. A number of insightful articles meanwhile appear in the maritime section, highlighting the greening of the sector, amongst other things.

In the field of international development, 2016 has been a year of consolidation as work continues to transform the ambitions articulated under the Sustainable Development Goals (SDGs) into tangible action. Quality education helps to guarantee societal success and the Global Partnership for Education actively pursues this in the world's poorest countries. Gaining an insight into the work of the partnership, PEN spoke to former Australian prime minister Julia Gillard, chair of its board. Following this interview is a contribution from Dhananjayan Sriskandarajah, who reflects on the outcome of the World Humanitarian Summit.

And for futurists and governments alike, the advances being made towards the construction of Artificial Intelligence demand consideration of unforeseen consequences. Some have warned that AI presents an existential risk to the future of humanity. With this in mind, Viktoriya Krakovna, co-founder of the Future of Life Institute, rounds out this edition of *Pan European Networks: Government*.

As ever, I hope that you will find these pages as informative and interesting a read as I have found in their creation, and I welcome any comments you may have.

CONTENTS

FOREWORD

03 INTRODUCTION

04



Amidst these turbulent times for the European project, the secretary general of the Council of Europe, Thorbjørn Jagland, reflects on how Europe should confront the migration challenge and deepen co-operation



Opening the 19th edition of Pan European Networks: Government, editor Michael Brennan details the focuses, articles and special features that can be found in the pages that follow

NEWSDESK

09

PanEuropeannetworks.com highlights the news stories that have dominated European governance during the spring and summer of 2016

SPECIAL FEATURE: BREXIT & THE FUTURE OF EUROPE

12

UK DEPARTURE

With Europe and the UK grappling with the consequences of a British vote to leave the EU, PEN reports on the outlook

12

BEFORE THE VOTE

Before the 23 June vote, UK politicians on both sides of the referendum debate gave PEN their thoughts on the future of the UK/EU relationship

14



THOUGHTS FROM #WEARESEAT123

When UKIP MEP Nigel Farage gave a speech in the European Parliament welcoming the leave outcome of the UK referendum on membership of the EU, the European commissioner for health, Vytenis Andriukaitis, was pictured holding his head in his hands. In the wake of that image going viral, he shared his thoughts on the future of Europe

18

SCIENCE AND THE BREXIT

The 'Brexit' could have a significant impact on the UK's science base, as Pan European Networks explores

19

BREXIT: WHAT NOW FOR EU FUNDING?

Dr Caroline Elston-Giroud on the impact that a Brexit vote could have on EU grant funding

20

NEW LEADERSHIP

PEN profiles Theresa May, the UK's new prime minister, and outlines the high expectations of her as she takes office

22



DEMOCRATISING THE UNION

With the European Union facing a number of pressing challenges, there is increasing attention falling on the role of democracy. The president of the European Economic and Social Committee, Georges Dassis, speaks to PEN about the state of democracy in Europe today, urging renewed dynamism in the European project

24

A NEW MULTILATERAL AGENDA?

Balazs Ujvari of Egmont – The Royal Institute for International Relations provides an insight into the future of the EU's multilateral agenda

26

ECONOMICS

29



FINGER ON THE PULSE

CEO of the Project Management Institute (PMI) Mark A Langley met with PEN at the 2016 instalment of the European Business Summit in Brussels to discuss the findings of the 'Pulse of the Profession'® report, highlighting the key challenges facing the management profession, and providing an insight on trends around project management

29

EUROPE'S ECONOMIC FUTURE

PEN details key interventions delivered during the Brussels Economic Forum, outlining how EU leaders are aiming to revitalise the economy

32

SPECIAL FEATURE: FINANCIAL INNOVATION

BUILDING BLOCKS

Siân Jones, founder of EDCAB, reflects on the role the EU should play as the potential of blockchain and cryptocurrency becomes apparent

34

PAYMENTS FOR OUR FUTURE

Ann Cairns, president of international markets at MasterCard, spoke to PEN during the European Business Summit 2016

36

BLOCKCHAIN BANKING

Thomas Egner reflects on the implications of the deployment of blockchain technologies in the European banking sector

38



WELCOME TO THE VALUEWEB

In an era of fast developing mobile payment technologies and the move towards a new age of finance known as the ValueWeb, leading independent financial commentator Chris Skinner details how we are only just beginning to realise the full impact that computers, the internet and digital technology will have on our lives and how we spend money

41

PROFILE: With smartphones gaining more and more applications, iQ Payments looks to add the purchase of travel tickets to the list **44**

WATCHING THE WATCHDOGS? **46**

The World Bank Group's Jarett Decker reflects on the implications of new EU rules regarding financial auditing

ENVIRONMENT


GREEN INVESTMENT, GREEN FUTURE **48**

Carrying the thoughts of EU Commissioner Karmenu Vella, PEN reflects on Green Week 2016 and its theme of 'Investing for a greener future'

 **ENERGY & CLIMATE** **50**

EUROPEAN CLIMATE AGENDA

While Europe may be a leader in taking action on climate change, it is evident that the EU and its member states will continue to increase the ambition. Jos Delbeke, director general of the commission's Directorate-General for Climate Action, speaks to PEN about the challenges the commission is confronting around climate change

 **NORWAY'S CCS LEADERSHIP** **52**

European countries continue to push forward with ambitions to reduce the impact of human activity on the climate. One key technology in this regard appears to be carbon capture and storage. With Norway at the forefront of CCS technology, PEN speaks to minister of petroleum and energy Tord Lien

CLIMATE CONTRIBUTION **55**

Andrew Purvis, from the Global CCS Institute, details the contribution that carbon capture and storage can make to climate targets

PROFILE: Sustainable Decisions Limited discusses the importance of the right institutional capability for sustainable low carbon economies **58**

CLEAN FOR A DAY **60**

PEN looks at the EU's plans for the future of renewable energy

PROFILE: Berdan-Tech LLC discusses the evolution of small wind and the urban and distributed technology of Be-Wind **62**

CLIMATE PREDICTION **64**

CLIMATE FRAME

PEN highlights the ways in which climate models can provide a framework for environmental research and global warming

PROFILE: BINGO is a 48-month Horizon 2020 Climate Action Research and Innovation project launched in July 2015 **66**

CONSERVATION & ECOLOGY **68**

A CONSERVATION CONVERSATION

The EUROPARC Federation's Carol Ritchie tells PEN how the not-for-profit is working to give a voice to protected areas in Europe

STAND UP FOR NATURE **70**

BirdLife Europe's Ariel Brunner tells PEN why better implementation of the Birds and Habitats Directives is a must

BOOSTING WATER INNOVATION **74**

With growing awareness of the critical challenges around water, the EIP Water initiative is pursuing efforts in the field

KEEPING IT CLEAN **78**

Ensuring that materials and products in contact with drinking water are fit for purpose presents diverse challenges

THE WATER OF THE ECONOMY **80**

Bruno Tisserand debates the Circular Economy Package and its impact on reusing water to create a more sustainable economy

GROWING IMPORTANCE **83**

PEN looks at the benefits and challenges of organic farming, and why it may be more important than ever

PROFILE: Terraseed Ltd is working on alternative weed control that is chemical free, organic and will bring benefits to horticulture **84**

HUMAN IMPACT **86**

CORE DEVELOPMENTS

PEN highlights the work of groups driving innovation in ecofriendly drilling technology


PROFILE: Norhard AS presents the technology that allows hydropower plants to enhance their capabilities by going underground **88**

BUILT ENVIRONMENT

SUSTAINABILITY WHERE WE LIVE **90**

Aware of the need to ensure a sustainable and innovative built environment, the European Construction Technology Platform is taking action

PROFILE: KLH Sustainability Ltd writes about the need to create a sustainable industry **92**

 **LIGHTING UP EUROPE** **94**

Diederik de Stoppelaar, secretary general of LightingEurope, discusses some of the main challenges facing European smart lighting innovators, explains why regulation isn't actually all bad, and sets out the role of the European lighting industry in the transition towards a circular economy

© Stadtwerke Augsburg GmbH
Thomas Heisnam



CROSS SAFELY

A city in Germany has taken a dramatic step to improve the safety of pedestrians using their mobile phones whilst walking. Speaking to Stephanie Lermen of public transport company Stadtwerke Augsburg, PEN investigates the 'smartphone traffic light' project, which sees special LED lights installed in pavements to inform citizens when it's safe to cross

98

PROFILE: Oy MTG-Meltron Ltd explains why there is more to dimming street lights than energy savings

100

LIMITED OPTIONS

102

David Nardone, member of the board of directors at the Synthetic Turf Council, reflects on the trends around recycling synthetic turf

TRANSPORT

104

TRA 2016

104

GOOD ADVICE

Dr Jean-Luc di Paola Galloni speaks to PEN on the fringes of the Transport Research Arena 2016

PROFILE: Concawe sheds light on the development of technologies that mitigate climate change and the transition to a low carbon economy

108

PROFILE: TRIS at the Politecnico di Torino faces the challenges of urban mobility head on, as Associate Professor Cristina Pronello explains

110

AUSTRIAN ACTION

112

Ursula Zechner, from the Austrian Ministry for Transport, outlined her country's progress in greening transport at TRA 2016

GREEN TRANSPORT

113

LIGHTENING THE LOAD

Speaking to PEN, Tecnalia's Alberto Peña Rodríguez and Iñaki Eguia Ibarzabal discuss lightweighting in the automotive industry

PROFILE: A perspective on the green potential that aluminium wheels offer is presented by Alcoa Wheel Products Europe

116

A FUNDAMENTAL SERVICE

118

FuelsEurope's Alain Mathuren explores what is needed to bring transport into a sustainable, efficient, environmentally friendly network

PROFILE: FuelsEurope on how the European refining industry is a strategic asset for Europe's economy

120

PROFILE: Franklin Energy provides charging and support services for the transition to the electric vehicle revolution

122

SMARTER CAMBRIDGE TRANSPORT

124

© Stephen Johnson



PEN spoke to Edward Leigh, chair of Smarter Cambridge Transport, about the state of transport in the UK city, the need for new measures to decrease pollution by focusing on cycling and public transport, and the group's proposals for improvements to rail and bus networks

PROFILE: The Canadian Urban Transit Research and Innovation Consortium shows why Canada is rising high in research and innovation

128

ELECTRIC VEHICLES

130

TRANSPORTATION TARGETS

PEN examines the European Commission's efforts to implement clean energy targets in the transport sector

ENERGISED OUTLOOK

132

The latest developments regarding batteries for electric vehicles, and ongoing obstacles, are detailed by Jos van der Burgt of DNV GL

THE WAY OF THE FUTURE

136

Mikko Pihlatie discusses electric commercial vehicles, mobile machinery and maritime vessels as the transport of the future

PROFILE: The ECV project works towards the proper implementation of electric vehicles for future mobility and business

137

© Michael Lee-Kocherzinger
RWTH Aachen University



ELECTRIFYING EUROPE'S ROADS

138

Micha Lesemann, chief engineer at RWTH Aachen University's Institute for Automotive Engineering, discusses the electric vehicle landscape in Europe and explains why public acceptance and changing boundary conditions will be instrumental in getting more EVs on the road

E-HIGHWAY FUTURE

140

The Swedish region of Gävleborg is embracing an e-mobility future, as Jan Nylander details

ROAD SAFETY

144

FANTASTIC FORS

The Fleet Operator Recognition Scheme (FORS) aims to be the UK's industry standard for fleet management services, as PEN discovers

VPC: SUPPORTING SAFER ROADS

146

SCC Marketing's Paul Stewart discusses vehicle powerline communication technology, which is helping to improve road safety

MARITIME

148

A BLUE HORIZON

Speaking to PEN, SEA Europe's Christophe Tytgat provides an insight into maritime technology matters

SAILING TOWARDS CLEAN SHIPPING?

150

The climate challenges surrounding shipping demand clear action, as argued by Sotiris Raptis of Transport & Environment

TRANSPORT (continued)

152

- PROFILE:** As 'blue is the new green', NCE Maritime CleanTech focuses on clean maritime solutions such as battery-driven ferries 152
- PROFILE:** The Wärtsilä Corporation explains how its technologies are moving shipping towards a greener future 154
- WATERTIGHT APPROACH** 156
- Innovation and marine maintenance are critical factors for the modern shipping sector, as detailed by PEN
- PROFILE:** RIMS BV helps to revolutionise your maintenance strategy with smart drone and robotic solutions 158
- PROFILE:** Clever Marine Services Ltd recounts its success at the Marine Maintenance World Expo 2016 trade show 160
- SIMPLE, YET DIFFICULT** 162
- With efforts devoted towards a clean shipping exhaust system, InnSep discusses the related challenges and the avenue for remedies

HEALTH INNOVATION & RESEARCH

164

- NURSING AND PUBLIC HEALTH** 164
- Paul De Raeve and Dorota Kilanska highlight the importance of innovation in nursing and its links to public health
- MicroRNAs – HUGE POTENTIAL** 167
- Researchers from the Medical University of Gdańsk's Department of Oncology and Radiotherapy reflect on cancer and microRNAs
- NEW HOPE** 168
- Treatment advances and new centres of excellence offer a lifeline to patients with inoperable neuroendocrine cancers
- PUT TO THE TEST** 170
- Dr Tariq Sadiq spoke to PEN about a new test for the rapid detection and subsequent treatment of four of the most common STIs
- HOW SHEEP CAN HELP PEOPLE** 174
- Moritz Tannast MD and colleagues discuss how the ovine model can prove useful in treating femoroacetabular impingement

ICT

178



THE TIME FOR TALKING IS OVER

With the fourth industrial revolution already underway, embracing and indeed boosting the digital transformation of Europe's industries is of paramount importance. Writing for Pan European Networks, Heinrich Daembkes and Laila Gide discuss the ARTEMIS Industry Association's Strategic Research Agenda 2016 and why digitisation must be addressed now

178

- KNOWLEDGE AND INFORMATION ARCHITECTURE** 180
- Organisations stand to benefit from better approaches to knowledge and information architecture, as Professor David Ellis explains
- PROFILE:** The U_CODE Project introduces a new tool for citizen communication and co-creation in urban design 182

SPECIAL FEATURE: INTERNATIONAL DEVELOPMENT

184

- EDUCATION AND DEVELOPMENT** 184
- PEN reports on the Global Partnership for Education's aim to deliver quality learning in the poorest countries
- HUMANITARIAN FUTURE** 186
- Dr Dhananjayan Sriskandarajah, secretary general of CIVICUS, reflects on the outcome of the World Humanitarian Summit

SPECIAL FEATURE: EXISTENTIAL RISK

188



FUTURE INTELLIGENCE

Viktoriya Krakovna, co-founder of the Future of Life Institute, spoke to PEN about AI Existential Risk (X-Risk) – the theory that an artificial super-intelligence may come to dispense with its creators – and how the research community is working to ensure that future intelligent technologies remain beneficial to humanity

188

Contents supported by:



The editor does not necessarily agree with or endorse any of the views or contents of the articles or features within this document or any external links contained therein. All articles and editorials remain the copyright of the authors, organisations and other relevant authorities by whose kind permission they are reproduced. All information has been checked and is correct at the time of going to press. The publisher will not be responsible for any loss suffered directly or indirectly as a result of the use of or reliance on the information contained herein.

Please note: All articles marked 'PROFILE:' in the Contents are advertising features
Front cover designed by Pan European Networks Ltd; Flag background image (EU and UK flag):
© Brilliantist Studio/Shutterstock.com
Top bar portrait images on the front cover: Thorbjørn Jagland © Council of Europe;
Vytenis Andriukaitis © ILFO; and Georges Dassis © European Union
ISSN 2049-3177 (Print); ISSN 2049-3185 (Online) © Pan European Networks Ltd 2016

Pan European
Networks

Pan European Networks Ltd
UK tel: +44 (0)1260 273802
fax: +44 (0)1260 279823

Brussels tel: +32 (0)249 403 57

info@paneuropeannetworks.com
www.paneuropeannetworks.com

The biggest stories in politics from Pan European Networks

While the dominating story in European affairs has been the UK referendum on membership of the EU and the leave result, Europe continues to grapple with a raft of issues.

Needless to say, the European news agenda will continue to be rife with the fallout from the UK vote. With a new government in power in London and negotiations on exiting the EU set to begin the informal discussions and developing of positions around the complex task of untangling the country from Europe is expected to take years. And as uncertainty in the aftermath of the UK result persists, so does consideration over the future of the European project.

Amidst these changes Pan European Networks continues to cover the developing European news agenda, shedding light on the stories that are shaping the future. Indeed, as highlighted below, Europe is working on a wide raft of issues such as the migration agenda and counter-terrorism.

The following stories all appeared on our website: paneuropeannetworks.com

TURKISH GOVERNMENT 'PURGES' PLOTTERS

Arrests continue in Turkey after Friday night's military coup attempt, with the Ankara government vowing to 'purge' the state of coup backers.

In the wake of the attempt, 2,700 judges and prosecutors have been detained, while 7,850 police officers have been suspended. Around 6,000 people have been detained by the Turkish authorities, including leading generals and admirals.

Justice minister Bekir Bozdağ said: "The cleansing is continuing. Some 6,000 detentions have taken place. The number could surpass 6,000." While the EU has condemned the coup – backing the democratic institutions – Brussels has voiced fears over the rule of law in the



country. In a statement, EU foreign policy chief Federica Mogherini and European neighbourhood policy and enlargement negotiations commissioner Johannes

Hahn said: "We underline the need for a swift return to Turkey's constitutional order with its checks and balances and stress the importance for the rule of law and fundamental freedoms to prevail." European leaders are concerned that Turkish President Recep Tayyip Erdoğan will use the coup as justification to purge the state of opponents. Speaking on the arrests ahead of an EU meeting, Hahn said: "It looks at least as if something has been prepared. The lists are available, which indicates it was prepared and to be used at a certain stage. I'm very concerned. It is exactly what we feared."

18 July 2016

ATTACK IN NICE KILLS 84

At least 84 people are reported to have been killed in a suspected terrorist attack in Nice, France.

At around 23:00 local time on 14 July, a man drove a lorry into a crowd of people who had gathered to watch a firework display for the annual Bastille Day celebrations.

The driver of the vehicle drove 2km along the Promenade des Anglais and engaged in a gun fight with police, before being shot dead.

As well as the scores killed, more than 50 people are reported to have been injured in the attack, including a significant number of children. It is believed many have life-threatening injuries.

In a televised speech, French President François Hollande said that the attack was of a terrorist nature, although this had yet to be confirmed at the time of broadcast.



No group has yet taken responsibility for the attack, and it has yet to be established whether the man was working alone.

The driver has yet to be formally identified, but papers found in the vehicle suggest that he was a 31-year-old man of French and Tunisian origin.

Other items found in the truck included guns and grenades, which the police later identified as fake.

Hollande has interrupted a visit to Avignon to return to Paris for a crisis meeting with French Prime Minister Manuel Valls. He has announced that France's state of emergency, which was due to be removed later this month, will now be extended.

15 July 2016

MAY SET TO BECOME UK PM

Theresa May is to become the UK's new prime minister as opponent Andrea Leadsom withdraws from the race.

Leadsom announced that she was quitting the race, citing excessive public scrutiny and abuse as the reasons for her withdrawal. It is now the responsibility of the 1922 Committee of Conservative backbench MPs to decide whether a leadership contest will still be held, or if May (pictured) will be given the post.

Results of the leadership contest were not due until September, but with May as the only running candidate, it is now expected that she will take over from the departing prime minister, David Cameron, within a much shorter timeframe. According to the BBC, negotiations are currently underway, with May adopting the title of prime minister-designate until such time as she is able to officially take over.



best possible terms for the British people and she has promised she will do so."

Meanwhile, Conservative MPs have largely backed May, and many have suggested that she should become prime minister as quickly as possible, in a measure which many hope will stabilise the UK's economy, which has been volatile since last month's Brexit vote.

11 July 2016

UK PUTS FORWARD KING AS NEW EU COMMISSIONER

UK Prime Minister David Cameron has suggested diplomat Sir Julian King as Britain's next, and possibly final, European commissioner after the resignation of Lord Jonathan Hill.

Hill resigned shortly after the country's Brexit referendum, in which it decided to leave the European Union. His finance brief will be adopted by Latvian commissioner and vice-president of the commission Valdis Dombrovskis as of 16 July.

King, currently the UK's ambassador to France, will be interviewed on Monday by current European Commission President Jean-Claude Juncker, and is likely to be the UK's final EU commissioner.



It is unknown when the UK will trigger Article 50 and begin its negotiations for withdrawal, but it is expected that whoever the UK's next commissioner is could play a major role in such negotiations.

A commission spokesperson refused to comment on what position King will take if he is accepted, but the role will be chosen after discussions between the commission and the UK government.

8 July 2016

EU RELEASES JOINT STATEMENT ON UK RESULT

EU leaders have met in Brussels following the result of the UK referendum at the invitation of European Commission President Jean-Claude Juncker (pictured).

Following the discussions, European Council President Donald Tusk, European Parliament President Martin Schulz, and Dutch Prime Minister Mark Rutte released a joint statement: 'In a free and democratic process, the British people have expressed their wish to leave the European Union. We regret this decision but respect it.'

Referring to the union as consisting of one member state fewer, the joint statement continues: 'The union of 27 member states will continue. The union is the framework of our common political future.'



growth, increase prosperity and ensure a safe and secure environment for our citizens. The institutions will play their full role in this endeavour.

'We now expect the United Kingdom government to give effect to this decision of the British people as soon as possible, however painful that process may be. Any delay would unnecessarily prolong uncertainty.'

The statement concludes with a sentiment of continued allied friendship between Brussels and the UK. The EU group of leaders express a desire for the UK to continue as 'a close partner of the European Union'.

24 June 2016

BREXIT CAMPAIGNS CEASE AFTER MP KILLING

Campaigns in the UK's European Union referendum have been suspended after the murder of a Member of Parliament.

Labour MP Jo Cox was shot and stabbed yesterday in her constituency, although it is unclear as to whether the motive was related to the upcoming referendum.

The BBC reports that both the Leave and Remain campaigns have been suspended as a sign of respect in the wake of the attack. Neither group has yet announced when it will resume campaigning ahead of the referendum on 23 June.

Speeches by Leave campaigners Michael Gove and Nigel Farage have been postponed. Prime Minister David Cameron, who is campaigning



© David Holt

to Remain, cancelled a rally that was planned to be held in Gibraltar, and Chancellor George Osborne changed a speech he was due to give at the annual Mansion House dinner in London to instead pay tribute to the MP.

Politicians from the Labour Party held vigils for Cox in London and Birstall, where the attack took place, while tribute was also paid at the Houses of Parliament, Downing Street and Buckingham Palace.

It is expected that both the Leave and Remain campaigns will continue the suspension of campaigning over the weekend, although neither group has confirmed this.

17 June 2016

MOGHERINI: EU PLANS TO HALT MIGRATION

The European Commission is preparing billions of euro in investment for African nations in an attempt to halt migration at its source.

The proposal could include ~€55bn from private sources and an EU contribution of around €4.5bn.

There is no official figure as yet confirmed but plans are expected to be published next month in a joint statement by commission vice-presidents Frans Timmermans and Federica Mogherini (pictured). Speaking to member states' foreign ministers yesterday (23 May), Mogherini said: "I cannot confirm the figures but I can confirm that Timmermans and I are working on a communication that we'll present in early June and that we'll bring to the European Council."



© EU2016 NL

According to EU diplomats, member states are addressing migration routes from northern Africa that exhibit an increasingly potential threat of terrorism. France, for example, sees

migration – from Libya in particular – as representing a more significant risk to security than other nations.

The European Union Naval Force Mediterranean (Eunavfor Med) exercise, begun last year to curb illegal trafficking and people smuggling, was extended by a year at the behest of Libyan authorities and EU foreign ministers to improve the training of the Libyan coastguard and navy.

24 May 2016

"GLOBAL RESPONSE" TO REFUGEE CRISIS URGED

The United Nations high commissioner for refugees, Filippo Grandi, has recommended more international co-operation in dealing with Europe's ongoing refugee crisis.

According to the UN, 2015 saw 20 million refugees, of whom only 1% were resettled in another nation. Grandi urged international co-operation to alleviate the burden on countries which were struggling, and recommended a "global response" to the large number of migrants fleeing conflict in Syria and elsewhere.

Speaking to the BBC, he said: "This has to spread more, has to be shared more, otherwise the imbalances will cause knee-jerk reactions, closures, rejections and in the end we will fail in our responsibility to help refugees.



© Adam Brown/Crown Copyright

There can't simply be a reaction whereby states shut down borders and push people away, because it won't work."

Grandi also emphasised the need to share the burden of migration.

So far, he said, responsibility has fallen "on a few countries that host hundreds of thousands of refugees, usually those near wars, near conflicts and a few donors that alone ... give 80-90% of the funding". Under the EU's Dublin Agreement, migrants must apply for asylum in the first member state in which they arrive, and can be sent back to that country if they leave for another. This means that countries such as Italy and Greece, which have been the point of arrival for many migrants, have had to take responsibility for resettling far greater numbers than other countries in Europe.

16 May 2016

PEN reflects on the outcome of a leave vote in the UK referendum on membership of the EU and the uncertain future ahead

UK departure

The outcome of the UK referendum held on membership of the EU was a vote to leave, and a turning point for the UK and the European Union. With 51.9% of voters opting for leave, the result was not the one the UK government – or Brussels – wished for. In the hours after the result was revealed, pound sterling saw dramatic falls in the markets and the UK Prime Minister, David Cameron, resigned, entrusting a future leader to begin the process of exiting the EU.

The breakdown of the vote revealed stark splits between the peoples of the United Kingdom. While in London, Scotland and Northern Ireland, the result was a firm vote to remain, in England and Wales, the verdict was leave. Indeed, Scotland's First Minister and member of the Scottish Nationalist Party Nicola Sturgeon made clear that her country would move to prevent being taken out of the EU against its will. She confirmed that the Scottish government is considering the possibility of holding another referendum on the country's independence from the rest of the UK following 2014's vote that returned a 55%-45% remain.

While charting the UK's departure from the EU will be challenging enough, the opening up of a constitutional crisis between the constituent parts of the country must now be confronted by UK politicians.

Economic fallout

In the hours and days following the outcome of the EU referendum, the shock to the UK economy was profound, sending reverberations across global markets. Part of the initial falls in the value of sterling and the UK stock market was due to markets being surprised by the vote, failing to price in the Brexit outcome.



While the Bank of England moved to implement measures to calm markets, governor of the bank Mark Carney stressed that uncertain economic times are in store. On 30 June, he warned that the country faces an economic downturn: "All this uncertainty has contributed to a form of economic post-traumatic stress disorder amongst households and businesses, as well as in financial markets – that is, a heightened sensitivity to downside tail risks, a growing caution about the future, and an aversion to assets or irreversible decisions that may be exposed to future 'disaster risk'."

Ratings agencies also moved to downgrade the UK's credit rating, with London losing its coveted AAA rating, indicating that the outlook for the country appears negative. Meanwhile, question marks continue over the prospects for financial services in the country; leaving the EU will likely see the UK lose its 'passporting' privileges for financial services delivered in the eurozone and European single market. The real prospect of jobs shifting from London to Paris, Frankfurt or Dublin is being considered. If the Brexit negotiations fail to secure privileges for the sizeable UK financial sector, London may well see the international banks who have made their home in the UK capital relocate to other cities within the EU.

While the future remains hard to predict, and the departure from the union could unlock long-term economic benefit, the short-term impact appears largely negative, and the UK faces the prospect of entering recession. Yet some parts of the economy may benefit from the decline in value of the pound. Exporters will face a potential boost as it becomes cheaper to buy goods from the UK, while the tourism market could benefit from an influx of foreign, particularly eurozone, tourists taking advantage of favourable exchange rates.

Article 50

Of course, the only legal way for a member state to exit the European Union is through activating Article 50 of the Treaty of Lisbon. At the time of publication, London has not triggered Article 50, opting instead to develop a negotiating position ahead of talks with fellow EU member states.

Indeed, while fellow EU countries have expressed regret over the UK's exit they have underlined the need to begin talks soon with a view to ending the uncertainty. Member states have made it clear that they would negotiate with the UK in good faith and seek a fair settlement for the country, however, the European Council – with the UK absent from a meeting for the first time – stressed that access to the European single market would only be granted on the basis that freedom of movement is respected by the UK. With European Council President Donald Tusk saying there can be no 'single market à la carte', it remains to be seen how the UK can control migration from Europe while enjoying the free trade benefits of the single market.

Further prompting concern is that the Article 50 negotiations will only address how the UK actually exits the EU, and will not deal with the future relationship between the UK and the remaining members of the union.

Underscoring the official stance in Brussels on the matter, on 30 June, the European commissioner responsible for trade, Cecilia Malmström, told the BBC's current affairs programme Newsnight that talks on a future relationship would only happen once the UK exits: "There are actually two negotiations. First you exit, and then you negotiate the new relationship, whatever that is," she said.

The complexity of the task at hand for the UK is stark. The country has not had to negotiate a trade deal since 1974, and the government urgently needs to acquire the expertise to excel in this key area.

UK gone

For Europe, this first reversal in European integration since its beginnings in the years following the Second World War brings the process to an abrupt stop. Eurosceptic politicians and parties across Europe have been energised by the vote. Parties committed to



The impact on the UK's political system has been dramatic

leaving the EU in other member states have pledged to hold their own national referendums on exiting the union. While mainstream political parties and the vast majority of the European elite remain committed to the project, there is a tacit acknowledgement that 'post-Brexit' there must be deep and serious consideration over the European future.

However, ultimately, while some of those in favour of the UK remaining in the EU – and in Brussels – may protest over how the referendum campaign was fought, the result has exposed the need for the European project to strengthen its appeal amongst European citizens.

Rightly or wrongly, if the EU is regarded as being undemocratic, or directly undermining the interests of its citizens, the legitimacy of the union will continue to be called into question.

Key national leaders such as French President François Hollande and Italian Prime Minister Matteo Renzi have publicly acknowledged the need to renew the project, integrating deeper in a more equitable fashion.

During a speech on the occasion of the 40th anniversary of the European People's Party (the centre-right European party with the largest number of MEPs), Tusk said: "Obsessed with the idea of instant and total integration, we failed to notice that ordinary people, the citizens of Europe, do not share our euro-enthusiasm. Disillusioned with the great visions of the future, they demand that we cope with the present reality better than we have been doing until now. Today, euroscepticism or even 'europessimism' have become an alternative to those illusions. And increasingly louder are those who question the very principle of a united Europe. The spectre of a break-up is haunting Europe, and a vision of a federation doesn't seem to me like the best answer to it."

For the UK, the political and economic changes are unparalleled; indeed, the vote to leave the EU ought to be seen as a revolution of sorts. As the country moves to uncouple from the union, many questions remain for Europe and the UK, and, naturally, PEN will continue to work to provide clarity on these key issues.



Prior to the momentous result of 23 June, eminent UK politicians on both sides of the referendum debate gave their thoughts as to the future of the UK/EU relationship

Before the vote

IN the build up to the UK referendum vote, Pan European Networks garnered opinions from both sides of the debate through a series of interviews with political figures known for their views on the concept, validity and importance of the European project. For the Remain campaign, PEN spoke to Sir Graham Watson and Ben Bradshaw. Watson is a former president of the Alliance of Liberals and Democrats for Europe Party who began his political career in 1972 and became the first UK Liberal Democrat to be elected as an MEP.

Bradshaw was elected to the House of Commons in 1997 and served in the governments of former Labour prime ministers Tony Blair and Gordon Brown. His time in office included appointments at both the Foreign and Commonwealth Office and the Department for Environment, Food and Rural Affairs where his remit included negotiating the EU's Common Fisheries Policy on behalf of the British in-shore fishing fleet.

For the Leave campaign, serving Conservative MPs and prominent eurosceptics John Redwood and Graham Brady outlined their reasoning.

An MP for almost 30 years, Redwood famously fought for the leadership of his party when then Conservative prime minister John Major stepped

down in 1995. Standing on a eurosceptic basis, Redwood lost, but secured approximately 25% of the parliamentary party votes, a development that can be considered a key factor in Major losing the 1997 general election.

Brady has been chairman of the 1922 Committee, an influential body of backbench Conservative MPs, since 2010. Prior to that, at the age of 30, he was the youngest Conservative MP elected to parliament in the 1997 general election and served as a shadow minister for Europe under four party leaders until his resignation from that frontbench post in 2007.

What are the principal reasons for your stance on the UK's future relationship with the European Union?

Watson: We have greater prosperity as a part of the EU's single market, greater security in the

fight against organised crime, and greater influence in the world.

Redwood: I want the UK to be a good European friend, ally and trading partner of the European Union. I'm very conscious that the UK wants very different things from its relationship compared to the agenda of most continental governments and countries, and so I think we can best be a good European friend by getting out of the way and allowing the euro area to complete its political union. I do think the euro area rightly understands that it needs to take a lot more central control. It needs to have one single economic monetary and political approach to the problems of running a complicated single currency area, and it would need to have much bigger transfers of money from rich to poor. Within the euro area, none of those are things that the UK wishes to be involved with.

Bradshaw: In essence, I think Britain is safer, more prosperous and has more influence as a member of the EU. Europe was ravaged by war for centuries, until the end of the Second World War, in which millions of British people died. In the last 71 years, however, we've enjoyed a period of unprecedented peace and security, thanks in part to the role of the EU.

The EU is the world's single biggest market, to which we have free access; that helps sustain millions of jobs nationally and thousands in my own constituency of Exeter. If you look around the world at all of our friends and allies in America, New Zealand, Canada, Australia, they all want us to stay; it's only people like Vladimir Putin and Donald Trump who want us to leave. I'd ask people which of that group one would rather trust.

Brady: There are many reasons. The EU is a failing institution unable to tackle the crisis in the eurozone or the migration crisis. The only way to settle the eurozone problem is a deeper political and fiscal integration – something that itself lacks the consent of the people in most eurozone countries. The EU is a political project – and one which has never been supported by the British electorate. If we remain in the EU we will continue to find ourselves constantly in



Sir Graham Watson

conflict with the process of integration. Fundamentally, this is about democracy. Britain will be stronger and safer if we can make our own laws, decide our own taxes and control our own borders.

What impact do you feel the renegotiation process and referendum will have on the UK's long-term relationships with partners in Europe?

Watson: It continues a process through which the UK has made itself at best a difficult partner and at worst a disloyal member of the club, unprepared to bear its share of the burdens.

Redwood: Once we leave the relationship will improve because we will no longer be holding the rest of the European Union back, and we will have a more honest relationship where we will want to be friends, we will want to be allies, we will want to do a lot of things together. We will want to carry on the trading arrangements we've got. I see no reason why the rest of the EU shouldn't have the same view. Whenever I've discussed these matters with representatives of European continental governments they've always made it very clear to me that they don't

John Redwood



© The Rt. Hon John Redwood MP



Ben Bradshaw

wish to impose any new barriers in the way of their exports to Britain, and of course they understand that if there aren't going to be new barriers in the way of their exports to us, there couldn't be new barriers in the way of our exports to them. So I think it could be easy to reach a very satisfactory, friendly relationship based around trade and other matters of common interest.

Brady: Following a vote to leave the EU, the British government should seek to be more outward-looking: Britain should trade and co-operate freely in Europe and globally. Our strategic relationships would remain and British military and intelligence services would continue to be a vital support for our European neighbours. Academic and scientific co-operation would remain a priority – it is just that British institutions would no longer have to bid to the EU for funds provided by British taxpayers. Academic co-operation should be global, not limited by geographical blocs. The net contribution of £10bn (~€13.2bn) a year that we make to the EU would allow us to defend all our important institutions.

Graham Brady



Bradshaw: I fear that with any renegotiation – not just in our relationships with the rest of Europe but with countries all around the world – which we would have to do because we would no longer be part of the EU trading bloc and part of the EU trade deals, we would have to renegotiate all of those relationships. As President Obama made very clear during his recent visit, we wouldn't be at the front of the queue, we'd be at the back.

We would have much less power as a country on our own than we have in a powerful bloc of 28 – the single biggest trading bloc in the world – and the idea that our former European partners are going to bend over backwards to give Britain a uniquely generous trading deal after we have voted to leave is for the birds. Nobody seriously thinks that is likely. On the contrary, I think it's far more likely that they would not do so, because they wouldn't want to send a signal to other countries that this was a sensible thing for people to do. It's about having one's cake and eating it. I think that's a very unlikely scenario.

Do you feel that the European institutions are responding appropriately regarding these challenges?

Watson: If they are not it is the fault of the people and governments of the member states who elect and appoint their leaders. In a democracy, people generally get the government they deserve.

Bradshaw: No, but as with any organisation or institution there is always potential for reform. We need to see the completion of the single market and services; that's very important and that will benefit the British economy very significantly indeed. There are always ways in which the institutions of the European Union – rather like any organisation, be it domestic or international – can be improved. The way to do that is by working together inside the organisation, not by taking our bat and ball away; we will have zero influence on how the institutions of the EU operate if we're outside. That's indeed the experiences felt by countries like Norway and Switzerland, who are outside

but still have to submit to the rules in order to trade freely with the single market.

Brady: No. When I was shadow Europe minister ten years ago, my message to politicians and diplomats around the EU who wanted Britain to remain was that they should be leading the calls for a more flexible EU within which Britain could be at ease. The refusal to agree a serious package of renegotiation this year proves that this message was never really taken on-board.

There are concerns across the bloc that reform, regardless of the outcome of the UK's referendum, is necessary for the EU to adapt to future challenges. Would you agree with these concerns, and would you therefore be in support of reformation should the UK remain a member state?

Bradshaw: There is a constant process of reforming the European Union institutions and the European Parliament as the EU evolves. For example, the eurozone has to more closely co-ordinate fiscal policy as, for obvious reasons, that will lead to further changes and further reforms. The UK is not part of the eurozone, along with a number of other countries, so we won't be affected by that. But there is always going to be change and reform, and we are one of the major countries in the EU that argues for streamlining and sensible reform. I think that's the best place to be rather than on the outside where we will be just as affected by decisions made but we won't have a voice in setting them.

One of the main points being made by the Brexit camp has been that the UK can increase its position on the world stage. What do you feel, in the wake of comments being made by world leaders (such as presidents Obama and Putin) and international institutions, the actual reality will be in the event of any potential Brexit?

Redwood: Britain will clearly be more influential in the world at large because we will get back our feet, our vote, our voice on a number of world bodies where we've given



The House of Commons chamber, where UK MPs will discuss Britain's future following Brexit

those away to a single EU representative in our place. So on world standard bodies and the World Trade Organization and world climate talks and others, the UK will resume with a full vote, voice, footing; and of course that would mean many other countries around the world will want to talk to Britain more than they do at the moment, because at the moment their first call is to Brussels, not to London.

Bradshaw: I think we will suffer an immediate economic shock. We are already seeing the pressure on the pound and fall-off in investment. It's quite clear to me that the repercussions of a vote to leave would be far more serious than that. That economic impact is not going to be recoverable overnight, because we will be thrown into years of tortuous renegotiations with all of our trading relationships against the backdrop of an economic crisis.

The issue around influence, I think, will be secondary to that, but, of course, it is also important and significant in the long run.

Brady: The EU is uncompetitive and is a declining proportion of the global economy. Our trade in goods and services is growing more quickly outside the EU than inside. Of course an outward-looking, globally minded UK can and will succeed. Foreign leaders can set out their interpretation of their own national interest (I think the US State Department view of the EU is decades out of date), but Britain should be free to act in its own national interest, too.

Regardless of the outcome of the referendum, would you support further reform of the EU?

Watson: Yes. I hope the UK might change its attitude, recognise its capacity to change the direction of the EU (rather than simply detaching the UK from the bits it does not like) and engage fully in the process of so doing.

The above responses have been amalgamated from four separate interviews first published on paneuropeannetworks.com between 3 May and 31 May 2016.

The image of European Health Commissioner Vytenis Andriukaitis holding his head in his hands during a speech made by Nigel Farage in the wake of the Brexit vote went viral. Here, we run the commissioner's blog in reaction

Thoughts from #WeAreSeat123

Alongside my fellow EU commissioners, I attended an extraordinary session in the European Parliament. Some photos – particularly that of my right hand – and videos have spread on social media. You will have seen me grimacing and trying to hide my despair while Nigel Farage spoke. I have enjoyed reading the many comments and can confirm that I do indeed appreciate British humour. But as tweets were exchanged, I felt it was important to share some more serious thoughts on how I felt during that session in parliament.

I was and still am fully with all the British people. I am with all those who voted against financial speculation uncovered in the 'Panama papers' and with those who voted against unemployment and decreasing standards of living. However, sadly, many votes will have been influenced by the lies spread by some representatives of the Leave campaign.

I am also with those who voted to remain in the EU, who want to create a better future for their families, and who believe that it is possible together, united in diversity, to fight against corporate greed and fraud perpetrated by financial transnational capitalism.

Toxic untruths spread by Farage and others, such as claims that money Britain contributes to the EU budget would be used for investments in healthcare, have now been revealed as lies.

In my heart, two symbols of this referendum remain – both of them are very different. One is the assassination of Labour MP Jo Cox and the other is of Jonathan Hill.

Jo Cox was killed because of people instigating hate, chauvinism and phobias. These are brutal forces infecting our democracies, destroying sentiment of security and values that we hold so dearly in Europe.

Lord Hill was decisive and stepped down. This is an example of moral self-determination, taking responsibility and embracing the consequences. This is in stark contrast to the actions of some others who personify political hypocrisy.



The famous image of the commissioner in parliament

Farage's reaction

The image of Commissioner Andriukaitis holding his head in his hands during Nigel Farage's speech during the European Parliament debate in reaction to the 'Brexit vote' was widely shared in the days that followed. Indeed, after his reaction to the UKIP MEP went viral, Andriukaitis published this reaction piece on his blog.

Famous for delivering acerbic speeches attacking the European project, Farage's speech on 28 June hailed the result of the UK vote on membership of the European Union.

Criticising the EU as being in denial, and labelling it as a failing project, Farage said: "The biggest problem you've got, and the main reason the UK voted the way it did, is because you have by stealth and deception, and without telling the truth to the rest of the people of Europe, you have imposed upon them a political union."

In widely reported remarks, the UKIP MEP also commented on the work experience of fellow MEPs: "What I'd like to see is a grown-up and sensible attitude to how we negotiate a different relationship. I know that virtually none of you have never done a proper job in your lives, or worked in business, or worked in trade, or indeed ever created a job. But listen, just listen."

While the eurosceptic politician may have been delighted with the result of the referendum held in the UK, it is clear that Andriukaitis remains committed to the European project. With uncertain times ahead for Europe, the passionate political discourse is set to continue.

Britain is changing. Young people in Scotland, Northern Ireland or London want to see a different future.

The EU is changing as well. For me its future lies in social justice and security. This is the way forward. And only together, with the EU member states, with the European Parliament, and with a decisive European Council – avoiding the cacophony and constant bashing of Brussels – can we achieve this.

This text was originally published on the commissioner's blog at: https://ec.europa.eu/commission/2014-2019/andriukaitis/blog/thoughts-weareseat123_en



Vytenis Andriukaitis
European Commissioner for Health & Food Safety

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



The 'Brexit' could have a significant impact on the UK's science base, as Pan European Networks discovers

Science and the Brexit

Following the UK's decision to leave the European Union, much has been said – by various actors, organisations, institutions and media outlets, and from both the 'in' and 'out' sides of the debate – about how the decision will affect the country's scientific research. Indeed, while a plethora of areas have been held up in the 'Brexit' debate by one side or the other – from NHS spending to immigration to environmental policy – science is, in many ways, a unique sphere of interest. The UK has produced some of the world's most famous and influential scientists, including historic figures such as Charles Darwin, Isaac Newton, Joseph Priestley, Humphry Davy and Michael Faraday, as well as contemporaries including Stephen Hawking, Peter Higgs and Tim Berners-Lee. And yet the 'eureka' moment often said to characterise the scientific discoveries of some of these earlier brilliant individuals has, over time, been replaced with an over-arching emphasis on the need for collaborative and co-operative efforts.

Collaboration

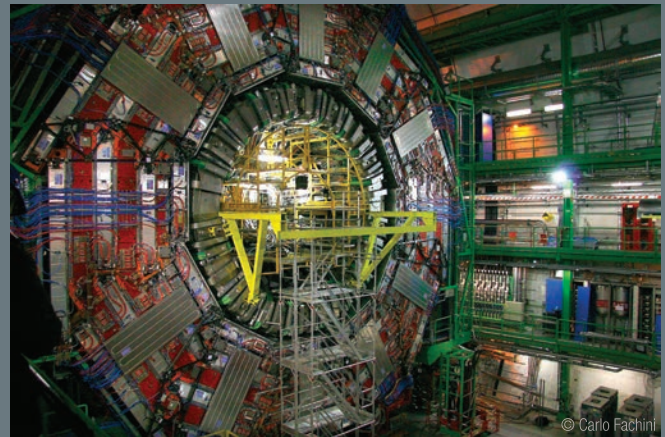
This is now exemplified by the advances being made within the most significant European scientific infrastructures such as CERN (where Berners-Lee invented the internet, and where the Higgs boson was discovered) and ESA (which recently landed a probe on the surface of a comet that was moving at a speed as great as 135,000 kilometres per hour, after a journey of 600 million kilometres). Of course, these organisations are independent of the EU and so the UK's continued membership would be unhindered post-Brexit. But they nevertheless demonstrate what can be achieved when brilliant minds come together.

One of the main arguments of the 'in' campaign was that an end to the Schengen Agreement, which allows EU nationals to travel to – and live and work in – the UK, will necessarily mean that fewer excellent scientists are able (or will want) to come to the UK to join its institutions and help to boost the country's science base. And, in many instances, scientific research and innovations become commercially viable products and so boost growth and jobs, so the knock-on effect of this is clear.

The 'out' supporters argued that the Brexit would not impact international collaboration – citing the example to the UK that countries with strict immigration controls in place (Australia, the USA) recruit more foreign researchers than nations such as the UK or France. Of course, with the referendum result not yet two months old, the impacts, or not, remain to be seen.

Horizon 2020

A further issue within the research domain is the UK's inclusion in Horizon 2020 – the European Union's flagship programme for research and innovation which will see around €80bn invested in science in the coming years. For the 'out' party, the formulation of associate agreements



CERN represents a fine example of the achievements made possible through collaboration

between the UK and the EU would enable Britain's scientists to access this considerable pot of funds and, in any case, much of the UK's European funding comes via the European Research Council (ERC), which is autonomous within the ERA, while money saved from EU membership could be funnelled into the UK's own research interests.

For those on the 'in' side of the debate, it is not only access to a share of this ~€80bn but also the willingness of project leaders to engage with actors outside of the EU which is cause for concern. And, what is more, an agreement similar to that between Switzerland and the EU would not, it seems, offer the same kind of 'bang for your buck' that full EU/H2020 access would garner.

In a recent edition of the influential *British Medical Journal*, Pan European Networks' senior editor, Clifford Holt, was asked to comment on how the Brexit would affect British researchers when it comes to European funding. His answer (as with all answers surrounding this question, it would seem) is that the future remains uncertain. While those organisations currently in receipt of funding appear to be able to continue to access these funds due to the fact that their grants have already been assigned, future funding is in question.

Article 50 has yet to be invoked, and so, for the time being, the UK's R&D landscape is in a kind of scientific/political limbo, with concerns being raised on one side only to be met with counter-arguments on the other. Both have their merits.

On 30 June, the British minister in charge of science, Jo Johnson, said that "it's business as usual for Horizon 2020", and so, in perhaps typical British fashion, activities will carry on regardless until more concrete agreements and announcements are made.

European Grants Manager at Ayming, Dr Caroline Elston-Giroud, discusses the impact that the Brexit vote could have on EU grant funding

Brexit: what now for EU funding?

Unless you have been asleep for the last few days, you will know that the UK is coming to terms with post-Brexit politics. No matter which way you personally voted, or the seemingly hundreds of different issues that people actually interpreted into their votes, one thing is generally certain – uncertainty reigns. Politicians, citizens, businesses, EU neighbours and global on-lookers are all waiting with baited breath to see what will fill the current void and who will bring ideas and stability to the table.

So what about UK science, technology and innovation in all of this?

Britain's vote to leave the EU has left our scientists and innovators worried about participation in EU funding programmes; from universities to research and development centres and to business, the UK has been extremely successful in receiving European science funding for over the last 20 years. From 2007 to 2013, the UK was second only to Germany in the amount of EU money received for R&D projects.

Some would go as far as to say that it filled a funding gap left by decreasing national government funding over the same period.

Since 2014, UK universities have received over €5bn of funding, according to European Commission data. Our innovative SMEs have been equally

Funding for UK science may continue as usual until Article 50 is triggered and exit negotiations begin

successful at winning funding in this hugely competitive environment.

The vote for Brexit understandably creates uncertainty over the future status of UK organisations receiving vital cash for R&D in key areas for all of our futures, from climate change, sustainability and renewable energy to ageing populations, Big Data and security.

But what happens next?

For the foreseeable future it's business as usual, but UK organisations will need to get ready to adapt quickly.

During the two years of negotiations once Article 50 is triggered, the UK theoretically maintains the current conditions. Until political leaders decide on the UK's future path, UK stakeholders should be able to participate in European projects. But where will the money come from?

In practice, Brussels and European leaders do not want to make it easy for the UK, and clearly they will be keen to dissuade other EU countries from following suit.

The European Commission has a precedent for this tough approach: in 2014, Switzerland was rapidly kicked out of the EU science and technology funding club, Horizon 2020, when it voted to limit immigration. Over two years later, the Swiss government is still paying the price and is self-funding the participation of Swiss partners in pan-European technology projects.

Maintaining the UK's strong scientific position

Whatever the political outcome of the next six to 12 months, it is essential the UK government outlines concrete measures to maintain access to participation in EU-wide science and technology projects. Furthermore, they must





EU Commissioner Carlos Moedas has sought to reassure UK researchers

take necessary steps to keep the flow of money going to researchers and innovators over the next two years and beyond.

Across Europe, and indeed the world, science, technology and innovation are considered vital indicators of a country's overall health and prosperity.

The UK is strong in all of these fields and is seen as a key player on the global scene; once the dust settles, fundamentally this position should not change, and our politicians should pull out all the stops to maintain it.

We could also come up with some out-of-the-box, home-grown ways of maintaining financial support for science and innovation in the UK. For example, UK companies can currently claim tax credits from the state for their research and development activities, but not for their innovation activities; for 'hard' science, but not for social or 'soft' sciences. Perhaps opening doors to different types of funding or extending the activities that can receive financial support could help to maintain our excellent global position in the future.

It is as yet unclear what impact the removal of EU funding will have on UK science and innovation



Some UK researchers have expressed concerns that proposals in which they were included are being denied funding on the basis that Britain is leaving the EU. Similar fears have been outlined by the UK's science minister, Jo Johnson, who warned that British scientists risk being excluded from European research projects due to uncertainty over the outcome of the Brexit decision. Johnson, brother of leading Brexiteer Boris Johnson, said that there is little statistical evidence that anything has changed, but that anxiety is widespread among UK institutions: "I have not been given a dossier of evidence that says it's happening in concrete terms. There is a suggestion it might be anecdotally."


Seeking to allay such concerns, the EU's commissioner for research, science and innovation, Carlos Moedas, wrote an editorial in the UK's *Times Higher Education* magazine assuring UK researchers that their participation would not be affected by the Brexit vote, and funding would not be restricted. Moedas wrote that the referendum decision would not affect UK scientists, at least until Britain begins the withdrawal process: 'The referendum as such doesn't change anything regarding their eligibility for funding under Horizon 2020, the world's biggest research and innovation funding programme. As long as the UK is a member of the European Union, EU law continues to apply and the UK retains all rights and obligations of a member state. But what would be the implications of the UK's leaving the EU? It is far too early to speculate on this question and provide the much-awaited answers. There is no precedent in the EU's history.'

Moedas highlighted the fact that the UK has been a major beneficiary of EU funding in the past. Under the Seventh Framework Programme, the UK received more than €7bn for scientific research. Under Horizon 2020, the UK has a success rate of 15.6% for its proposals, above the EU average, and is at position seven out of 28 in terms of innovation output. The commissioner emphasised that for the purposes of funding, the UK will continue to be treated as a member of the EU until Article 50 is invoked and withdrawal negotiations begin.

Ultimately, and prior to Brexit, the UK has the second largest EU economy and makes major contributions to the overall budget, so there will also be repercussions for the next pan-European science and research funding programme that follows Horizon 2020. In a post-Brexit situation, the UK should perhaps seek to make itself a reliable and once again stable neighbour, rather than an awkward family member.

**Dr Caroline Elston-Giroud
European Grants Manager
Ayming**



A portrait of Theresa May, the UK's new prime minister, looking slightly to the right. She has short, wavy, light-colored hair and is wearing a dark blue jacket and a patterned scarf. The background is a dark, textured wall.

In the wake of the EU referendum, Theresa May became the UK's new prime minister. PEN charts her rise to power and the significant challenges now facing her

© Twocom / Shutterstock.com

New leadership

ON 13 July, Conservative MP Theresa May accepted Queen Elizabeth II's invitation to form a new government and became prime minister of the United Kingdom. Her predecessor David Cameron stepped down after the UK's historic vote to leave the European Union, triggering an election contest which was expected to last nine weeks. Ultimately, the campaign was cut short on 11 July when the only remaining candidate aside from May, Andrea Leadsom, withdrew from contention. May became a leader-in-waiting as Cameron formally stepped down, before officially moving into Number Ten Downing Street two days later.

Since she was first elected to parliament in 1997, May has been tipped for higher political office, and comparisons to former PM Margaret Thatcher, both in terms of physical appearance and political ambition, have followed her throughout her career. As the UK's second female prime minister, May has to some extent lived up to such predictions, although the character of her governance is yet to be seen.

Like Thatcher, May rose from relatively humble beginnings to become prime minister of the UK. She was born in Sussex on 1 October 1956, the daughter of Zaidee Brasier and the Reverend Hubert Brasier, a Church of England minister. She was educated at Heythrop Primary School, Oxfordshire, a state comprehensive, followed by an independent Roman Catholic school, St. Juliana's Convent School for Girls. She went on to attend the University of Oxford to read geography, and graduated with a second class Bachelor of Arts degree in 1977. At Oxford, May found

herself allied with the Conservative Party, and while attending a party function met Philip May, whom she married in 1980, an investment banker for Capital International.

Member of Parliament

After defeats to Labour candidates in 1992 and 1994, May was elected MP for Maidenhead in the 1997 general election. By 2002, she had become the chairman of the Conservative Party, the first woman to hold the position. That same year, May gained public attention when she gave a speech broadly criticising the Conservatives, famously suggesting that voters viewed the party as "the nasty party" given the landslide defeats to Labour's Tony Blair at the 1997 and 2001 general elections. In particular, May suggested that diversity was necessary in the party's politics if it wished to represent more voters: "I want us to be the party that represents the whole of Britain and not merely some mythical place called 'Middle England', but the truth is that as our country has become more diverse, our party has remained the same."

May's rise continued and she became home secretary in Cameron's first cabinet in 2010, after the general election had returned the first coalition government in the UK for 70 years. May was to remain in the post for six years, the longest such spell since the 1950s.

While May presided over a number of successful negotiations as home secretary, some of her actions were controversial and drew criticism from members of other parties as well as her own. In 2013, the UK decided to opt out of all 133 EU police and criminal justice measures, with the intention of choosing which it would re-join before December 2014. May promised MPs a vote on which measures the UK would adopt, but ultimately proposed a package of 35 justice powers, of which only 11 were voted on in parliament. This angered a considerable number of her Conservative colleagues, who felt denied the opportunity to debate some of the measures included, most notably the European Arrest Warrant. May subsequently went on record to say she felt "battered and bruised" by the experience and that she could have handled the situation differently.

On other Europe-led issues May, like Cameron, has been more combative. In 2013, she expressed opposition to some elements of the European Convention on Human Rights and the European Court of Human Rights after the deportation of radical Islamist cleric Abu Qatada was blocked; she told members of the UK parliament that the bodies have a "crazy interpretation of our human rights laws". At the time, and to much rancour, May argued that a UK withdrawal from the court should be left open to discussion, although she has since pulled back from this opinion given a lack of parliamentary support.

Following recent events, it remains to be seen where the UK will end up with regards these institutions until Article 50, the clause by which the UK formally asks to leave the EU, is triggered and Britain's withdrawal negotiations begin.

Brexit

During the referendum campaign that led up to the Brexit vote, May was nominally a member of the remain camp, but one that was seldom seen or heard. However, now that the UK has voted to leave the union, and she has become prime minister, May has insisted she will honour the result of the vote and negotiate the best possible deal for the UK and EU's future relationship. Indeed, a number of appointments in her very first cabinet attest to such a stance. The leading 'Brexiters', former London mayor

Former prime minister David Cameron stepped down following the UK's referendum vote to leave the EU



Boris Johnson, has been surprisingly announced as the UK's foreign secretary, and David Davis, a renowned eurosceptic, has been given the newly created office of secretary of state for exiting the European Union. The moves signal May's determination that the UK will be strongly represented in all UK-EU negotiations once Article 50 is enacted.

The perception in Europe is that she is pragmatic and is likely to be a tough negotiator. Commentators in Britain have pointed out that her support for the remain campaign means that she has something to prove, which ironically could mean the UK's new prime minister will be even more determined in her negotiations than a candidate from the leave side would have been.

Tenacious

May has been characterised in the UK as a leader who expects unconditional loyalty and is meticulous in her preparations to ensure that strong action is taken when necessary. She is viewed as tenacious and stubborn in her beliefs, and has been hailed for her bold political positions; nevertheless, close sources say she is willing to listen to well-reasoned arguments and is not inflexible in her stance.

Upon becoming leader of the Conservative Party, May issued a statement which outlined some of the priorities that would follow her into the office: "First, the need for strong, proven leadership to steer us through what will be difficult and uncertain economic and political times. The need of course to negotiate the best deal for Britain in leaving the EU and to forge a new role for ourselves in the world. Brexit means Brexit, and we're going to make a success of it. Second, we need to unite our country. And third, we need a strong, new and positive vision for the future of our country. A vision of a country that works not for the privileged few but works for every one of us. Because we're going to give people more control over their lives. That's how together we will build a better Britain."

The prime minister's predecessor, Cameron, has expressed confidence in May's ability to succeed in the role. Cameron served as prime minister for six years, first as part of a coalition between the Conservative and Liberal Democrat parties formed in 2010, and from 2015 as leader of a Conservative majority. It is expected that May will continue to build on the work that Cameron did within the Conservative Party, to move the organisation towards a more centrist, inclusive and diverse ideology.

The European and global political map changed with the result of the UK's Brexit referendum. Theresa May is the personality now charged with taking the UK on a different course. Capitals throughout Europe and the wider world are now repositioning in readiness for Britain's new 'Iron Lady'.

Amidst an apparent democratic challenge facing the union, Georges Dassis, president of the EESC, speaks to PEN

Democratising the union

With the European Union facing apparent existential challenges, there has been increasing focus falling on the EU's democratic credentials. Examining the issues in this area, PEN speaks to the president of the European Economic and Social Committee (EESC), Georges Dassis. Describing itself as a bridge between Europe and organised civil society, the EESC aims to be at the heart of democratic dialogue in today's European Union. Here, Dassis provides a personal insight on Europe and democracy while reflecting on the challenges ahead for the European project.

Do you feel that today's EU is democratic enough?

No matter how democratic, open and historically unique it may be, the European project is currently facing some difficulties. Like everyone who firmly believes in the democratic essence of the European project, I am deeply distressed to see a shift away from the foundational values and principles of the European Union, and a growing discontent amongst citizens who feel estranged from decision making processes. These trends have been exacerbated by austerity, the lack of an effective social policy during the crisis and mass unemployment, particularly among young people, as well as by the rapid rise of inequalities and poverty, now affecting even those who have jobs.

The refugee crisis has revealed problems in articulating a concerted EU strategy and a regrettable lack of solidarity by certain member states, while the right of citizens to move freely in the Schengen Area is being contested. Yet, despite this difficult conjuncture, the European Union cannot be the problem but only the solution. In sum, what needs to be done is to strengthen the social foundations of the European

Dassis in front of the EESC buildings in Brussels



© European Union, 2016

Union. I have repeatedly said that our first aim should be to bring Europe closer to its citizens. This is what we have to work on now.

What role does the EESC play in promoting democratic engagement with the European project?

The European Economic and Social Committee, since its foundation with the Rome Treaty in 1957, constitutes the house of civil society providing the bridge between European institutions and organised civil society. It actively promotes democratic engagement through its members, who represent authentic social partner organisations reflecting the entire socioeconomic spectrum: employers' organisations, trade unions and various organisations like agricultural or consumers' organisations. Apart from its structure, the functioning and the procedures of the EESC fully conform to democratic principles and take account of the views of civil society in promoting democratic engagement with all aspects of the European project. Last December, for example, we were the first institution that responded in a timely manner to the refugee crisis. We launched fact-finding missions in 11 member states and Turkey to meet with civil society organisations and identify needs and problems, as well as best practices in handling the refugee crisis. The synthesis report of these missions has been delivered to the commissioner for migration, Dimitris Avramopoulos, and we believe that it will be a useful tool in developing a common European migration policy.

As regards priorities and activities in this field, what do you plan in the near future?

Thank you for your question, which gives me a good opportunity to describe a significant item on our current agenda. During my meeting with President Juncker last February, I had the chance to express my deep concern about the situation in the EU, emphasising that to safeguard the European venture and its values of peace, democracy and social justice, we urgently need to bring the EU closer to



Europeans. Sharing my concerns, the commission president explained the commission's proposal to launch the European Pillar of Social Rights, raising the prospect of consulting the EESC to ensure strong support for his initiative. I am pleased that the president kept his promise and referred the matter to our committee. We are working fully on this initiative, including sending fact-finding missions to member states to meet with social partners and examining the social rights situation in each country. The outcome will be a relevant opinion to be forwarded to the European Commission as the basis for the proposed European Pillar of Social Rights.

Should civil society have a greater say in EU policy making? Do you feel the EESC should have greater powers in this regard?

We recently witnessed the vital role of organised civil society in the migration/refugee crisis. Beyond doubt, civil mobilisation has tremendous potential to shape social developments and it must be fully deployed. So, I reiterate that the voice of civil society must be heard: we must work for a Europe that protects and includes ordinary people, improving the living conditions that have been adversely affected by economic recession.

I believe that the EESC has been effective and efficient, playing a key role in shaping European policies. We are an advisory body and our proposals may not always be accepted. Nonetheless, we have had significant success overall, as many of our detailed recommendations, including a European

minimum income, a financial transaction tax and the issuing of Eurobonds, have been taken on-board by the commission.

Do you feel the European project can restore its democratic credibility amongst citizens and overcome challenges such as the rise of populism?

Apart from the major political issues I mentioned earlier, a key problem we face today is that the EU does not speak with one common voice on a number of issues. In the current context, this state of things seems quite difficult to change. Unfortunately, there is a tendency by politicians to nationalise any successes we have at European level while blaming the EU for whatever might go wrong. At the same time, the information provided to citizens sometimes lacks credibility. As I often emphasise, the current conditions ideally suit populists and other hate-mongers, giving them an opportunity to deceive vulnerable people with empty promises about a future, a 'golden dawn', that can be ensured only behind inviolable borders as in the good old days. To overcome this upsurge of populism we should urgently change our discourse, tackle unemployment and implement social policies to help citizens surmount their difficulties.

Lastly, I consistently argue for the introduction of a special course on recent European history in schools in all member states, which would allow our children to learn about the hardship our forebears suffered in Europe by war and authoritarianism and appreciate the achievements of the EU since 1952. In short, it is not too late to put things right, but we must not delay anymore and act now.

Georges Dassis
President
European Economic and Social Committee

www.eesc.europa.eu



With the European Union Global Strategy endorsed by the European Council, Balazs Ujvari, of Egmont - Royal Institute for International Relations, assesses the long-term prospects for the EU's multilateral action

A new multilateral agenda?

The European Union's action on the international stage has been given a new impetus in the form of the European Union Global Strategy (EUGS). While uncertainties about the document had long persisted, the EU high representative for foreign affairs and security policy, Federica Mogherini, eventually presented the document on 29 June to the European Council. EU leaders welcomed the document and invited the commission and the council of the EU to 'take the work forward'.

This comes right in the wake of the referendum of 23 June in the United Kingdom on the country's membership of the EU, which resulted in the victory of the Leave campaign (52%). While many may have thought that the 'Brexit' would tempt the remaining 27 member states to go back to the drawing board and boost their joint ambitions, the high representative, to the surprise of many, adhered to the initial timeline. Her move was mostly likely informed by the recognition that EU leaders would be less likely to pose obstacles to the EUGS at a time when the European project is already facing significant divisions and seems to be losing – for the first time – one of its members.

New vision

One of the key deliverables of the EUGS is certainly to serve as a basis for an updated EU vision of how the international system should function – in the form of a new multilateral agenda for the union. Indeed, in an age of unprecedented global interdependence and connectivity, no



Balazs Ujvari

The future of the UK's membership of the EU could impact on the agreement of the European Union Global Strategy

country or regional entity can play a leading role in international policy making without such an agenda.

The European Security Strategy (ESS) of 2003, the quasi predecessor of the future EUGS, made some tentative steps in this regard: the document expressed a commitment to building an 'international order based on effective multilateralism'. This 'effective multilateralism' doctrine of the EU, which essentially amounted to support for legally binding commitments agreed upon by the largest number of nations possible through strong multilateral institutions, has not necessarily come to define the international relations of the past decade.

While policy making via universal deals has endured with regard to certain dossiers such as the Paris climate deal or the Iran nuclear talks, decision making in other areas has tended to shift to plurilateral, minilateral or bilateral fora. This has been the case especially in the field of development and trade policy, where the landscape is characterised by an increasing number of parallel structures (regional multilateral development banks) and initiatives (mega-regional free trade agreements). In addition, while the ESS did specify how the EU should act on the international stage, it failed to specify on which policy areas the union should focus in doing so, leaving its multilateral agenda too generic and devoid of priorities.

Minilateral

Arguably, the recently endorsed EUGS offers a chance to redress the above shortcomings plaguing the EU's multilateral action. As rule-based multilateralism remains, however, deeply entrenched in the union's DNA, the EUGS does not necessarily represent groundbreaking innovations as to how the EU should act in international affairs. As former





© The European Union

British diplomat Alyson Bailes pointed out, the EU's 'deepest interest lies in making others – and eventually the world – more like itself'.

Yet, the strategy appears to reflect the recognition that effective multilateralism as the *modus operandi* of international policy making across all domains – as may have been wished for by the ESS of 2003 – is increasingly questionable today. It seems therefore inevitable that the EU's approach be more flexible, giving room to other forms of multilateralism such as *ad hoc* coalitions, minilateral formats, strategic partnerships and transnational networks to the detriment of formal institutions. While such arrangements are often less inclusive and legitimate than international institutions, entailing as well the risk of duplicating efforts, they can also allow for flexibility, innovation, compartmentalisation and speed.

If used strategically, minilateral initiatives in particular can also serve to pave the way towards broader multilateral frameworks, as with the approval by the United Nations Security Council of the outcome of the E3/EU+3 negotiations with Tehran.

Co-operation is key

A joint publication of the Egmont – Royal Institute for International Relations and the European Policy Centre edited by this author asked a number of analysts of EU affairs weeks before the endorsement of the EUGS by the European Council about their vision of

The European Security Strategy was agreed by the European Council in 2003 and is the quasi predecessor to the EUGS

Minilateral initiatives can help lead to broader multilateral deals, including with the United Nations Security Council

a future EU multilateral agenda. The overarching conclusion that had emerged from this paper was threefold and is also reflected to a large extent in the Global Strategy's reflection on a 'Global Governance for the 21st Century'.

First, co-operative relationships between the EU and key emerging powers (especially China) on the international scene will be increasingly central. In view of the gradually fragmenting global governance landscape, it appears all the more important for the EU to extend its outreach efforts to a much larger number of partners than before when acting in multilateral milieus. The EU's protracted recovery from the 2008/2009 financial crisis combined with emerging powers' newfound assertive and proactive role in international policy making results in a global environment where an increasingly wide consensus is needed that embraces an ever broader set of views.



© Neptunul



© Jean-Etienne Minh-Duy Poirrier

Focusing solely on the EU's strategic partners will not be sufficient. The EU can only be successful in promoting its interests on the global stage if it attaches adequate importance to understanding the wide range of positions taken by its negotiating partners – not only individually but also as a bloc – as well as the interests underlying these stances. Depending on the policy area in question, the key partners for, and adversaries of, the EU will change and can only be identified through ample outreach activities in the run up to multilateral negotiations.

When promoting counter-terrorism efforts globally, for example, the EU may need to co-operate especially with North African and Middle Eastern countries along with the United States, while the championing of a global climate regime will demand more outreach towards the rapidly industrialising and growing nations of Asia.

Innovative international affairs

Second, in approaching multilateral affairs, the EU needs to demonstrate innovative thinking and embrace the changing nature of international affairs. Rather than clinging to the traditional formal institutions, EU member states would benefit from adopting a more flexible attitude. As a first step, this could entail the joint assessment of the recent wave of BRICS-led international organisations, which have the potential of shaping the orthodox policy discourse in areas such as poverty reduction by drawing on the positive domestic experiences of its founders.

Europeans, however, do not necessarily have to remain passive observers of the reshaping of the global governance scene. They, too, could launch novel multilateral mechanisms or unilateral processes which could help pave the way towards veritable global deals. Furthermore, it will be increasingly inevitable for the EU to shift its perceptions with respect to emerging and developing countries and regard them as equal partners instead of considering its relationship with them as a one-way street.

By giving more attention to what Europeans can learn from Latin American and Caribbean countries, for example, the EU will also stand a better chance of securing their diplomatic support when advancing its

objectives in multilateral fora. Moreover, in acting on the international stage, the EU could also enhance its effectiveness by drawing on a so far unorthodox mixture of policies: a closer integration of scientific knowledge with security and trade policy considerations could, for instance, considerably enhance the EU's ability to remain at the cutting edge of international policy making in these areas.

Multilateral future

Finally, as the foremost embodiment of multilateralism, the EU must maintain its ambition in pursuing multilateral solutions. The fact remains that the union is best off in a world that reflects the functioning of the EU itself. This does not mean that the 28-country bloc must necessarily call for legally binding international agreements through formal institutions with the broadest membership possible across the board – as the ESS of 2003 may have envisaged. The solution of global or regional issues will increasingly shift from traditional institutions to more informal networks and *ad hoc* coalitions, and this is not all bad news for Europeans.

The EU needs not to necessarily compromise on its ambitious proposals but rather to make an informed choice as to the multilateral/plurilateral/minilateral platform where it seeks to advance its agenda. International policy making could thus continue to be driven by the EU, but should not necessarily be defined by it. Building on this first mover advantage, the right choice of platform and the involvement of the stakeholders affected most directly by the issue at hand, the EU will continue to stand a good chance of securing support for its multilateral actions – however ambitious they may be.

Balazs Ujvari is a joint research fellow at the Egmont – Royal Institute for International Relations and the European Policy Centre.

Balazs Ujvari
Egmont – Royal Institute for
International Relations

www.egmontinstitute.be



CEO of the Project Management Institute Mark A Langley discusses the findings of the *Pulse of the Profession*[®] report and provides an insight on trends around project management

Finger on the pulse

AS the scale and scope of public projects expands, the need to ensure high quality project management performance is self-evident. Working with public and private sector leaders, the Project Management Institute (PMI) is a key player when it comes to advancing the project, programme and portfolio management profession. Each year PMI publishes the *Pulse of the Profession*[®] report, highlighting the global trends facing the profession.

The key finding of 2016's edition of the report is that due to poor project performance, out of every billion US dollars spent on projects, European organisations waste an average of \$141m (~€124.4m). With this level of waste, which is more than the global average on spending projects, it is clear that there is room for improvement when it comes to the region's approach to project management. Globally, the 2016 edition of the report found that organisations wasted 12% more due to poor project management practices than in the year before, indicating that the trend is worsening.

During the 2016 European Business Summit, PEN sat down with the PMI's CEO, Mark A Langley. Discussing the findings of the report and other key



Mark A Langley

trends in Europe today, Langley provides an insight on trends around project management.

What were the major takeaways from the 2016 *Pulse of the Profession* report; and what were the principal challenges that you had in putting it together?

The PMI *Pulse of the Profession* report is one of the platform pieces for our thought leadership series and has been conducted annually since 2006. The findings were generally consistent with those highlighted in previous years, and the report also enables us to identify and study the difference between high performing (those that are more successful in projects and programmes) and low performing organisations, along with some of the high performing organisations' key practices. These include things like having a well-defined, documented career path and having ongoing processes for skills development in line with the European Qualifications Framework (EQF) in terms of lifelong learning.

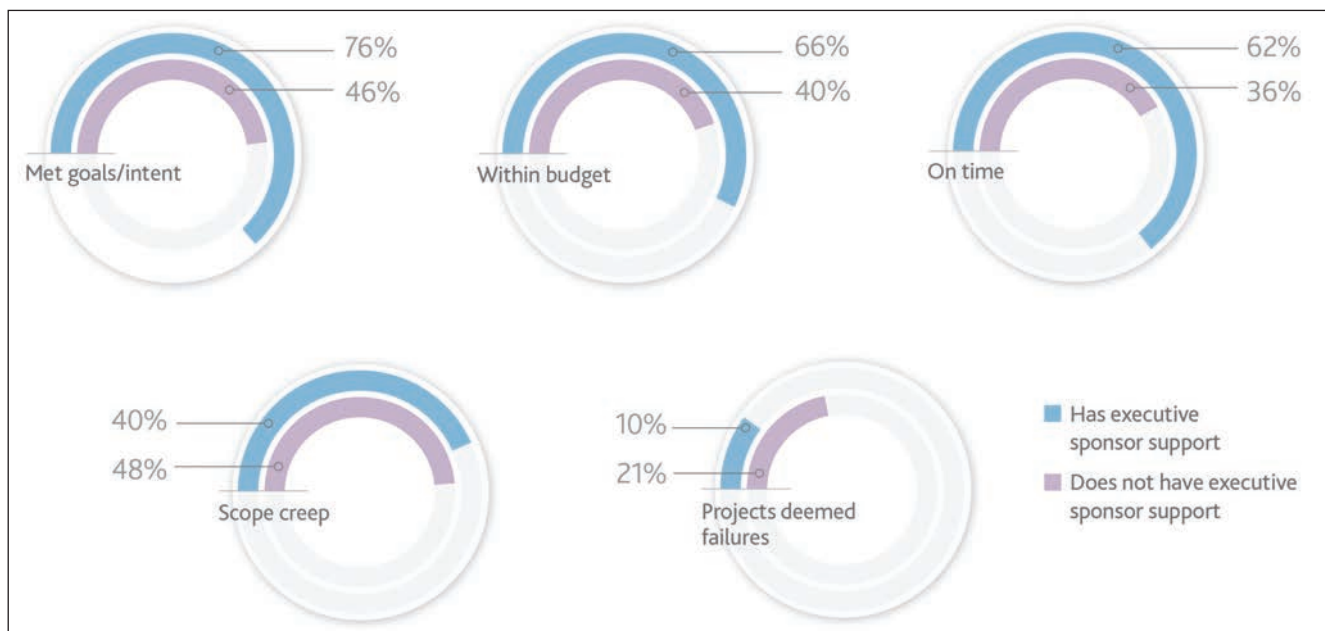
We have found that these organisations are embedded in a process to develop skills in the longer term and, often, they also standardise practices and have a common language for the way they conduct their business. They are also much more aligned to strategy.

We also know that high performers waste 13 times less due to better project performance, which is a significant amount of money.

What do you feel are the key lessons that the European institutions, as well as the stakeholders who are interested in EU level governance and EU funding projects, can learn from the report?

Our report has clearly identified that performance in the EU is, on average, slightly





worse than elsewhere, with a waste rate of about 14%. Our subsequent work has found that the appetite for improving this performance is significant, and much of this comes down to administrative capacity. As such, we are now working with members of the European Parliament and commission in an attempt to raise the overall capacity in Europe to absorb the funds and implement them well. We see the same debate in governments around the world and, typically, two schools of thought prevail: more revenue through taxes or a reduction in spending, and the cutting of the budget. However, there is actually a third asset which should be taken into consideration: greater efficiency. If major programmes become more efficient and effective, they will save money, and that can be added to the funding available in additional programmes.

In terms of trying to resolve wastage, institutional and cultural shifts are regularly cited as being key to making a breakthrough. But what role can be played by leadership in helping to empower and bring forward better performance in projects?

One of the key success factors to every organisation that performs well is engaged executive sponsors who really understand project and programme management and what it takes to be successful. They are not only champions at the beginning, they are champions throughout each of the major

programmes, communicating the value and breaking down the barriers to success.

If the resources aren't there, these sponsors can help break down the barrier to them, and they can help the programme to course correct. Thus, this can help to set the actual culture from the top by helping the organisation to understand project and programme management. The sponsors have a critical role to play, and our research indicates that success is often found where they are most effective.

Could you give me more of an insight on the work you have been exploring with the EU institutions?

From a European Commission standpoint, we work with various director generals, be it with DG Connect (for IT) or DG REGIO (for regional policy), in terms of raising their practice and their capability and helping them solve some of their own issues in terms of competency development. One of the things we focus on is helping organisations develop the right competency skills and behaviours, and we do that in what we call the 'talent triangle' – sound technical project and programme management skills are needed, but leadership skills and strategic and business management skills are also required in order to be effective.

Most organisations tell us that leadership skills – things like communication, conflict resolution, negotiation, organisation change management – are incredibly important early on for project success, because when you manage a programme you are really managing the people who are working on that programme, and so leadership becomes essential to success. We therefore work with the commission and their staff as they implement project and programme management in their various organisations; we identify what the practices are and what competency skills are needed, and then we support them in that.

We also produce standards which the commission can utilise in their methodologies, and we certify project programme portfolio managers so that they align with our qualifications.

Regarding members of the European Parliament, here we are focused more on educating and helping them to solve administrative capacity issues by creating awareness of the potential of improving those through good programme management practices and providing content in EP committee debates. More recently we have been appointed by the commission staff to various countries struggling with administrative capacity. As such, we attend various sessions within the parliament designed to identify these issues and offer to conduct research on their behalf, for example, in order to really identify the practices and steps needed to improve the overall administrative capacity.

From a policy standpoint, we have also helped with the Common Provision Regulation, which saw numerous amendments a few years ago and which was related to project and programme management.

Do you feel that there is a greater capacity to better engage national governments with the need to include credit management practices? Is there more willingness here to engage with your work than, say, there is from the private sector?

Very much so, and one of the things we noticed as Europe began to emerge from the global financial crisis was that the public sector was much more aligned with private sector practices. In past recessions, which may not have been as steep as the most recent one, the public sector would return to its old ways quite quickly, but here we found that they were much more interested in what the private sector was doing so that they could go on to incorporate some of the best practices back into government. We have seen that in the UK and Scottish parliaments, and a great interest in improving private programme management capability to become even more efficient is now evident.

While, as discussed, the debate often centres on either increased revenue or less spending, it should also include a discussion of efficiency – how can we be more efficient and effective in what we fund so that we actually save money (and waste less), which can then be invested in other areas?

In current US legislation, for instance, there is a bill going through the House of Representatives that is likely to be signed called the 'Programme Management Improvement and Accountability Act', which demonstrates the interest here – and this is something that is also evident in other parts of the world – in building this type of requirement in government. Indeed, India has recently developed a competency development framework utilising the PMI standards, meaning that the Indian government is doing the same thing as the UK and other countries in Europe, and is very much interested in improving the practice.

Looking towards the next six to 12 months, what are your key priorities as an organisation?

We will always be focused on talent management because this is one of our core philosophies and because experience has shown that in order to be successful you have to have the best and the right people. We will thus help organisations, both public and private, to identify competency skills and behaviours as well as practices that will make them more successful and have the most successful people.



On average some 12% of budgets can be wasted due to poor performance

We will also continue to highlight the importance of benefit realisation – in areas that, in 2016, we have already published two studies on, with a third in the pipeline. This is becoming increasingly important to executives in both the public and private sector as we really need to ensure that we get the best benefits from funding.

Are you optimistic looking towards the future that the public sector can address its quite significant waste issues?

I am optimistic due to the fact that the interest we have seen on improvement after the financial crisis has not yet waned, and while progress is slower in some areas than in others, the general sense is that the public sector remains focused on implementing the right steps to achieve an enhanced level of efficiency and effectiveness.

The focus on people is also critical, and this is another common theme which emerged after the global financial crisis, during which, in marked contrast to the approach taken in previous recessions, many organisations tried to retain their top talent so that they didn't have to go back and rebuild that workforce afterwards. This is certainly a reason for optimism moving forwards.

Mark A Langley
CEO
Project Management Institute (PMI)

<http://www.pmi.org/>

Amidst efforts to help Europe overcome persistent economic difficulties, structural reforms offer much potential, as emphasised during the Brussels Economic Forum 2016

Europe's economic future

AS the European Commission's flagship economic event, the annual Brussels Economic Forum (BEF) sees Europe's economic and financial leaders come together in the Belgian capital to discuss economic dynamics in the EU. Hosted on 9 June and attended by roughly 1,000 participants, 2016's edition of the forum took as its subtitle 'Structural Reforms 2.0 and the Revamped EMU (Economic and Monetary Union): Fostering Jobs and Growth in the EU' and placed a strong emphasis on the continuing evolution of economic reform in the union. Here, PEN details some of the interventions and speeches given by the key personalities present.

ECB view

In an opening keynote speech, the president of the European Central Bank, Mario Draghi, delivered the annual Tommaso Padoa-Schioppa lecture. Draghi focused on the contribution that monetary policy can make to unlocking economic potential and thereby stimulating the economy, as well as the role of central banks – being independent yet interdependent on other policies implemented by national governments – and their interactions.

"In a speech in Vienna last week, I explained why monetary policy could deliver the appropriate level of stimulus to the economy, even in a setting where interest rates are close to their effective lower bound," he said. "As inflation is ultimately a monetary phenomenon, a committed central bank can always fulfil its mandate – and that is true independently of the stance of other macroeconomic policies. But monetary policy does not exist in a vacuum. The situation of central banks is better described as 'independence in interdependence', since other policies matter a great deal: they can buttress or dilute the effects of our policy; they can slow down or speed up the return to stability; and they can determine whether stability is accompanied by prosperity, which is directly relevant to the social cohesion of the euro area."

Reflecting on the role that central banks play in the economy in shaping monetary policy, Draghi stressed how economic potential can be realised through pursuing structural reforms, bringing forward measures to increase employment and productivity, and outlined a series of measures that hold potential in promoting employment and productivity.

But with divisions between leaders across Europe on the best way forward in the area, Draghi added: "There are many understandable political reasons to delay structural reform, but there are few good economic ones. The cost of delay is simply too high. Given the interactions between policies it is in everyone's interest that the various strands of policy buttress each other – if only because that would shorten the time it takes for each to produce its effects. And that would mean that we can bring growth back to potential before potential itself becomes damaged."



Mario Draghi

Coming to the end of his address, he said: "Of all the ways to accelerate the realisation of our economic potential, perhaps the simplest is to remove the uncertainties that hamper long-term decisions and hold back investment. And speaking here in Brussels, I can only underline in this context the costs of postponing the reform of EU and euro area governance that all agree is necessary, and by the same token, the boost to prosperity and stability that would result from removing those uncertainties, without undue delay."

Policy from Brussels

Alongside Draghi, a key EU figure in attendance was Pierre Moscovici, the commissioner responsible for economic and financial affairs, taxation and customs.

"Europe is emerging from an economic crisis of unprecedented proportions, one which laid bare the need for deep reforms and a comprehensive policy approach," he said. "I am delighted to have this opportunity to share my views on why structural reforms are so essential for fostering growth and jobs in Europe – and on the type of reforms that I believe we now need to prioritise.

"To effectively tackle the risk of persistent low growth, near-zero inflation and high unemployment, we need to combine structural, fiscal and monetary policies in an



integrated and growth-friendly approach. This means, in my view, tackling both the demand and supply sides of our economies, because the impact of the crisis has been both cyclical and structural. In other words: the crisis hasn't only weakened aggregate demand, it has also lowered our potential for economic growth. That is why supply-side structural reforms have been, and remain, a key part of Europe's response to the crisis."

Moscovici's speech emphasised the need to build support for the reforms that Europe has pushed forward in recent years, expressing confidence that the structural reform encouraged by Brussels offers great potential for driving forward growth in the European economy.

Speaking later in the day was commission vice-president for jobs, growth, investment and competitiveness Jyrki Katainen, who built on the earlier messages delivered during the event.

"ECB governor Mario Draghi has given an excellent speech here today, and I must say that I fully agree with what he has just said. If you look at economic growth in Europe and one part of it, namely lack of investment, the reality is that we are below the long-term average in terms of investment, and it is mostly down to lack of competitiveness of member states," he argued.

"Everybody knows what the Central Bank is doing at the moment with almost non-existent

interest rates, low oil prices supporting demand and still growth is not as good as it is supposed to be. It is improving, stability has come back to Europe, but still things are not improving as fast as they could be. It is mostly because of structural weaknesses in our economies.

"It would not be wise to expect too much more from the European Central Bank than what they have done already. That is why the European Commission is concentrating more than ever before on the structural side of our member states' economy. We need more structural reforms."

Reform needed

Stressing the need for European countries to pursue such reforms, Katainen went on to outline initiatives being pursued by Brussels (such as the Investment Plan for Europe, the Circular Economy Package, the Energy Union initiative and pushes to decarbonise transport) and the contribution these are making, before rounding out his speech with a key message: "Ladies and gentlemen, there is no magic wand to boost economic growth or investments in Europe. We can provide – and we are already providing – risk financing; we are providing technical assistance and advice to investors; we have established a platform that will give better visibility to good projects; and we are pushing forward with Europe-wide structural reforms in order to create a better market. We are also encouraging member states to reform their societies because we have to be competitive again and there is no reason why this could not happen in the near future."

The Brussels Economic Forum highlighted the need for continuing structural reforms and deeper integration as part of the solution to European economic concerns. But while the commitment to drive forward reforms was made clear by the leaders present, it remains to be seen if promises of economic growth can be realised.

As interest around the revolutionary potential of blockchain technology continues to mount, PEN speaks to the founder of EDCAB, Siân Jones

Building blocks

Cryptocurrencies and distributed ledger technologies are revolutionising the finance industry, offering security and privacy in peer-to-peer financial transactions, and Europe is leading the way in fostering the environment for the embrace of these truly game-changing technologies. Siân Jones is the founder of the European Digital Currency and Blockchain Technology Forum (EDCAB), a non-profit organisation which liaises with policy makers, legislators and stakeholders to create a space for blockchain technology and virtual currencies. She spoke to PEN about advances in virtual currency technology, Europe's role at the forefront of its development, and industry needs. With blockchain in its infancy – Jones likens the present stage of development to that of the internet in the early 1990s – it is evidently a critical moment for the technology.

There is a lot of interest in the developments you are working on around blockchain technologies, cryptocurrencies and related subjects. What are your views on the role of the European institutions and policy makers? Do they understand these technological innovations and the implications of their deployment?

I think that the recent European Parliament Economic and Monetary Affairs Committee report on virtual currencies shows an incredibly astute understanding of the subject. I think the rapporteurs have definitely gotten to grips with this innovation. They understand the technology remarkably well and have thought through the implications, which I think is truly insightful but also unusual, because it is a technical subject and the implications are easily misunderstood. But, in the main,

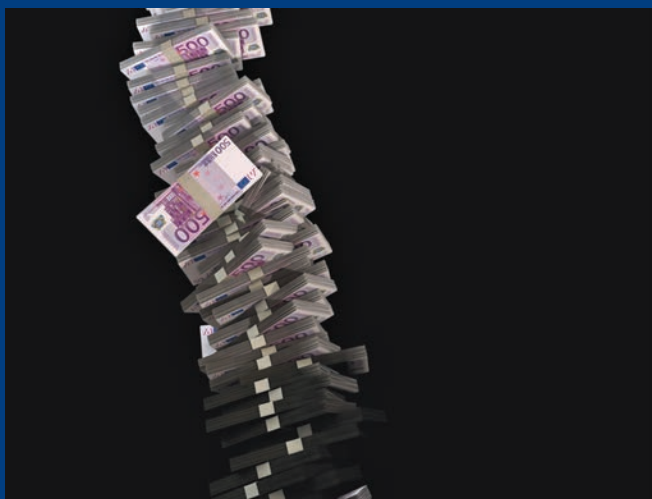
they've avoided falling for the headlines and have instead got to grips with the subject.

What would you like to see from the European Commission or the European Council in terms of concrete actions and proposals in support of your work?

We were asked to give an address at a public hearing on virtual currencies in January, and a clip of this can be found at the EDCAB website (<http://www.edcab.eu/>). What we called for was in large measure what we've received so far; for example, we advocated that legislators should avoid jumping to introduce legislation and regulations around new technology, because the business activities and actors in those spaces are probably regulated in any event, and if they are then the development of the technology is already regulated, and, if not, then that should remain the case.

This is new technology which is in its very early infancy, but we're trying to reach its full potential and figure out exactly what it's going to do, what the purpose is, and what the possibilities are. We need some breathing space to achieve that end, to let the technology flourish, and then afterwards to see if there's a need for regulation. That is actually what we've got from parliament, and the committee's report has some encouraging words to say about the innovative potential and the desire not to stifle that potential with too much regulation at the outset.

At the same time, we recognise that as any new technology grows, things can change and develop quickly, and so we must keep a watchful eye on blockchain technologies in case specific risks emerge. For example, we need to keep an eye on cybercrime risks – whether credit derived or systemic risks – and, where appropriate, take whatever action is needed.



So, to monitor the technology, ECON proposed the creation of a task force that would be set up and led by the commission. In his response, Commissioner Hill indicated that the commission sees virtual currencies as something to be included in the mandate of a new FinTech task force. In this way, there may be a very pragmatic approach that won't involve unnecessary cost burdens for citizens, but still achieves the same end result in ensuring that the technology is monitored for potential changes in risk profile.

That fairly hands-off approach is to be applauded, but there is one specific area of legislation that's being considered as part of the commission's action plan to combat terrorist financing, which is to include virtual currency exchanges and custodian wallet providers as 'obliged entities' within the 4th Anti-Money Laundering Directive, and that responds to the council's call at the end of last year, and its endorsement of the plan at the beginning of February. I think parliament and the council will almost certainly support the proposal.

How does working and doing business in Europe compare to other regions of the world, e.g. the US or Asia, when it comes to innovating in finance? What advantages does that have when it comes to addressing challenges?

If we are looking at virtual currencies and blockchains then I think Europe has now positioned itself head and shoulders above other regions of the world in this regard. It's unusual for the European Parliament, or indeed any parliament, to endorse a technology, which is in effect what they did in late May. They have recognised innovative potential and therefore the benefit of innovating in this field, which gives encouragement to innovators to start their own businesses and use this technology.

Businesses benefit from certainty, especially regulatory certainty, and this is a new technology and it has not been clear up until now what the regulatory landscape will look like. That uncertainty is a slowing factor in innovation as it affects willingness to invest, inroads for venture capital, and even businesses being able to open bank accounts.

This is a problem that's quite widely known across a range of FinTech areas, but particularly so in virtual currency and blockchain-related businesses and start-ups. It can be a struggle to get banking operating and to open bank accounts, and part of the reason for that is regulatory uncertainty. But now, Europe has given some regulatory certainty by saying that it's not something that they want to regulate beyond the fundamental anti-money laundering considerations that are particular to virtual currency exchanges and custodian wallet providers. That means the rest of the space – because we can't yet call it an industry – now has some certainty that it's not going to be regulated in terms of blockchain or virtual currency regulations, only the regulations that already exist. This allows them to know exactly what they are expected to do and what rules they need to meet when making an exchange, and allows them to work out their compliance cost and adjust their business models accordingly.

In the rest of the world, this is not the case. For example, in New York they introduced early regulation that was wide-ranging and comprehensive. When last I checked, there was only one company there with a bitcoin licence one year down the line; the small, innovative businesses had fled the state, and so you can see that that approach had a stifling impact upon innovation. Of course, this is not everywhere in the world, but I don't know of anywhere that has given as much certainty to enable businesses to plan, operate and interoperate with other businesses, banks and payment institutions as Europe.

What is your perception of the reactions of more traditional institutions in the finance sector – banks and other organisations – to bitcoin technology and other emerging innovations?

Bitcoin and virtual currencies are problematic for banks, and I think they will remain so for some time. I'm not expecting a dramatic change on cryptocurrency-related business as a result of the adoption of this report; I think that will be a slower process, perhaps years.

But in terms of banks' use of the technology themselves, I think we have seen a huge growth in banks' interest in blockchain and distributed ledger technology. There are probably very few banks that are not doing some work in that space, and some are very involved, undertaking proofs of concept to see how they can use the technology to bring more efficiency to their businesses, and how some financial industries could be reshaped by use of the technology. Certainly, the regulatory certainty that's now been given will be helpful in accelerating their interest in this field.

Sián Jones
European Digital Currency & Blockchain Technology Forum

www.edcab.eu

Ann Cairns, the president of international markets at MasterCard, speaks to PEN about financial inclusion and the future of payments

Payments for our future

IN May this year, MasterCard published the findings of a survey on Financial and Digital Inclusion in Europe. Amongst its analysis, it found that while 74% of the population consider financial inclusion to be important, only 49% believe there is a high or somewhat high level of inclusion in their country. Just 22% said that they consider Europe to be the most financially inclusive region in the world. Amidst this, two out of three Europeans expect national governments to take responsibility for improving financial inclusion.

In western Europe alone 90 million Europeans are financially excluded with no access to services such as current accounts. Over half of those interviewed in the study don't feel engaged in the economic system, and a clear gender gap perception exists, with 83% of those polled agreeing that they believe men have a higher degree of financial inclusion than women.

Speaking on 2 June at the European Business Summit 2016, a gathering of European business and political leaders, Ann Cairns, president of international markets for MasterCard, addressed these key issues and, later, talking to PEN, made plain her concern that so many Europeans feel this way.

Asked what she would like to see come forward at the EU and national level to address the challenge, Cairns acknowledged that there have been moves to confront economic exclusion, citing the efforts in Italy to introduce a prepaid card that acts as a bank account. Users of the card are able to receive money and use the card to make payments. Mimicking cash, such 'stored value products' hold much promise in tackling the challenge.

She told PEN: "I think governments also have a big role to play in including their citizens. If they started paying government payments directly to people electronically, and provided those excluded people with such means of receiving payments, that would change the inclusion picture. We've seen that a lot in places like South Africa, Egypt and Kenya. Some of the governments in the emerging markets realise that that's the only way to get people included."

In contrast, the MasterCard executive cautioned, European governments could do more to embrace such approaches.

Thinking about barriers

Evidently, new and innovative developments hold great potential, and with the commission pursuing the Digital Single Market initiative, Cairns sees an opportunity. Reflecting on the need to bring down barriers, she said that visitors to European countries should be able to access and pay for services in the same way as locals. For example, if a visitor to Italy hires a car while in the country, there is a growing feeling that they should purchase the rental in just the same way as a local rather



Borders should be no barrier to payments in the digital age

than purchasing the rental through the branch of the hire company back home. With an increasing expectation that the market should operate in this way, Cairns stressed that the MasterCard payment approach causes no blockages in cross-border payments.

Welcoming the potential removal of obstructions, she said: "If we get rid of national barriers, though – if you think about it from the point of view of a small business in Italy or the UK or Germany – it means there really is a single European market to go after. Their access to all those consumers has just increased dramatically."

Indeed, there is a sense that the payment infrastructure is in place, and markets such as China and the United States have proven that scale is no barrier.

While MasterCard would happily see the European single market deepen further – removing the barriers to business and transactions between EU countries – Cairns explained that there is a need to ensure that Europe does not put up unnecessary walls. Such excessive regulation can prevent small and large business alike from working in an efficient cross-border manner.

Education

Evidently, Europe has opportunities ahead, one example of which is its education systems.

Cairns pointed to how this can be better leveraged to enable a more innovative future.

Arguing that schools ought to teach children computer programming – essentially a language – she said: “You learn languages quickly when you are young. I think here in Europe we have to get the governments, the employers and the education system all working together to say: ‘how do we upskill our population to be effective in the digital age?’ With the advent of digitisation, jobs will go away, but new jobs will be created in the service and commerce sectors. The more educated the population, the more able they are to use digital technology – and with a more entrepreneurial approach – the better.”

She went on to highlight that in contrast to Europe, the United States has embraced a business culture that is much more forgiving of failure. Indeed, Cairns described the environment on the other side of the Atlantic as “refreshing and entrepreneurial”. Further, it remains clear that start-ups and businesses in Europe face more challenges than their counterparts in the US do, with the wider discourse during the summit highlighting this. Access to capital and the approach towards digitalisation are continuing challenges in the European business environment.

New financial tools

Recent years have seen growing interest in the application of new and innovative technologies such as blockchain distributed database technology. Asked how MasterCard is approaching blockchain, Cairns acknowledged the “huge potential” of the technology, saying there will be use cases that extend beyond the financial world.

In complex transactions – such as trade finance – where there are many entities involved, blockchain can help to ease business as a distributed hardened ledger concept that is independently verified. “You can see that blockchain could speed things up,” Cairns said. “It could reduce costs and it could create robustness.”

However, she cautioned, it is not a panacea, and while it may be a “great technological concept”, MasterCard is still working with partners to consider what the best use case for it might be.

As an underlying technology, Cairns said that it would be good to have as little regulation as possible, with market forces working on the

Payments, Cairns stresses, should operate in the background as consumers conduct transactions



adoption of blockchain. Regulation would be in place to ensure that things are operating properly in a secure and safe way. Ultimately, she emphasised, the adoption and growth of such new technologies need to be driven by market forces.

National difference

Today, different approaches amongst EU member states towards payments persist, both in terms of acceptance and use amongst consumers and businesses as well as payment infrastructure. In some countries, the transition to a cashless society is taking place; in others, the acceptance of cards and electronic payments is much lower.

Asked about the transnational barriers and costs in the way of consumers and businesses, Cairns said: “My view is that consumers are the people we should really be serving and they should have a choice. You should be able to choose when you pay, how you pay and what you pay with, and you should have a really good seamless consumer experience. All of this should work in the background.”

“When you get up in the morning, you’re not thinking about making a payment, but you might be thinking, ‘I’ll buy myself that tie’. The payment process is happening somewhere mid-cycle after you have already chosen the tie you want to purchase. The consumer wants that to happen in the background in the safest, most efficient and best way possible.”

Thus, Cairns emphasised that there remains a need for designing the process from the consumer point of view. In doing so, barriers will actually be tackled: “Creating more local systems across Europe is not going to solve that problem; it’s actually going to go in the opposite direction. Some of the pushes into creating local payment processing companies are not necessarily helpful. Those local companies have to join with other companies when they work across borders, and they probably won’t be able to work outside their borders without costs. But what do borders mean in a digital world?”

Ann Cairns
President of International Markets
MasterCard

www.mastercard.com

The Euro Banking Association's Thomas Egner outlines a few considerations on the opportunities and risks related to the use of cryptotechnologies in the transaction banking space

Blockchain banking

Digitalisation is changing our daily lives as well as our business environment in unprecedented ways. The banking industry is no exception. There is a strong sense of transformation even in the traditionally more stable areas of transaction banking, such as payments. In this part of the financial industry, the reliable, timely and cost-effective end-to-end delivery of salary and pension payments, of transactions settling electricity bills and paying the rent, has always been a central focus of the main actors running this business, which in the past were mostly banks. The need to create solid infrastructures based on collaboratively developed industry standards and reliable mainframe technology used to naturally slow down the pace of change. Today, there is a shared notion in the industry that the new era of transformation, which for Europe started with the successful implementation of the Single Euro Payments Area, will continue to unfold at an ever increasing speed.

Where does this accelerated transformation come from? The increasing digitalisation mentioned above as a first key change driver is obviously underpinned by new technology and new ways of using technology. Second, evolving customer needs and expectations – partly fuelled by the enhanced digital customer experience in other areas of professional and private life – certainly play a crucial role. Third, there are new entrants targeting this alleged 'bread and butter' market with their own fresh take on payments. Their approach is often based on business models that do not consider payments as a cost

Digitalisation is set to impact the economy and society, and the banking sector is considering the implications

factor to be minimised but rather as a bridge to be crossed to unlock new business opportunities. Fourth, there is a great deal of ongoing regulatory activity, which to a large extent is motivated by the three other change drivers, since it concentrates on aspects such as paving the way for increased innovation and transparency across the European payments market, creating a level playing field for competition and enhancing the security of internet payments.

As this description of change drivers already indicates, technology is not only a major change driver *per se* but also the elephant in the room when it comes to determining the shape and impact of the three other change drivers. Technology, or the combination of technologies, by itself has the potential to disrupt the traditional behaviour or processing mechanisms of the major actors in transaction banking.

Our work

Against this background, the Euro Banking Association (EBA), a pan-European forum for payment practitioners, has been analysing and assessing the potential impact of emerging or rapidly evolving technologies on areas in transaction banking where these technologies could quickly and most easily leave a deep footprint. Considering the use of cryptotechnologies in the area of trade finance, for instance, seemed an almost natural choice because of the perceived benefits this new technological approach could bring to some of the fundamental processes in this area. That is why the topic of applying cryptotechnologies to trade finance was placed on the agenda of the EBA's working group on cryptotechnologies very shortly after the creation of this dedicated group composed of payment and trade finance professionals.

Before looking more closely at the work of the EBA in this field, we should briefly clarify the definitions of cryptotechnologies and trade



finance. By cryptotechnology, we mean a technology putting in place a shared, uniform ledger of transactions that is replicated among all participants over a network of interconnected computers, with the security and accuracy of the ledger assured through the use of cryptography (instead of through verification by a central counterparty). Cryptotechnology is an umbrella that includes terms such as distributed ledger (often used as 'distributed ledger technology' or DLT) and blockchain. Trade finance is used as a generic term for a range of traditional trade finance techniques (such as letters of credit, and documentary and related trade loans) and evolving supply chain finance techniques.

In its analysis, the EBA working group concluded early on that while the use of cryptotechnologies has the potential to fundamentally transform trade finance in the long term, it is likely that their practical adoption will proceed gradually around specific use cases. The group identified two suitable use cases for such early adoption scenarios: the exchange of trade data and financing.

Let us first have a look at the use case around the exchange of trade data, which is the backbone for the trade finance workflow. The approval and matching of data found in trade documents such as invoices can be a trigger for events that follow, such as the transfer of ownership or execution of a payment. Today, these data are in many cases still locked up in paper forms, which makes the processes handling these data slow, cumbersome and comparably non-transparent. They would very much benefit from a digitalisation approach that could at the same time enhance the overall transparency of the processes through the use of a shared ledger-based technology.

Digital benefits

By facilitating easy access to data and end-to-end transparency of the entire value chain, cryptotechnologies could play a major role in improving the exchange of trade information and of information on the resulting payment between the concerned parties and in helping to keep track of the transaction history.

This enhanced exchange of trade data and auditability of a participant's credit history are essential prerequisites for increased speed, efficiency and security in financing between



While there is much excitement around blockchain technology, it is important to ensure security

buyers, sellers and their banks, which the EBA working group identified as the second key area in trade finance that would strongly benefit from the use of cryptotechnologies. As a matter of fact, the real-time visibility of events along a supply chain, which cryptotechnologies enable, means that financing triggers can be identified sooner, resulting in a faster release of funds. Cryptotechnologies could also contribute to improving credit ratings and risk assessment procedures, which would help ensure security for banks and could lead to improved financing terms for buyers and sellers.

As these two use case examples from the trade finance area show, cryptotechnologies undoubtedly hold value for the transaction banking and payments industry and have the potential to significantly change business models and improve processes.

However, it should be pointed out that in network industries, of which transaction banking and payments in particular are prominent examples, it will probably take more than a compelling new technology to make a difference: this technology has to be combined with the right co-operative approach and effort to create the necessary large-scale effects. Connecting different providers and reaching commercial transaction partners are key for acceptance and, finally, the success of any infrastructure. Building wide reach is so important because not all business partners have an account or a business relationship with the same institution – and should not be forced to.

Freedom to choose

What is true for private and commercial customers applies to banks as well. Banks should not be forced to participate in several interbank clearing systems. This requires that the infrastructure solutions they use need to be interoperable, which means that they have to be based on commonly agreed standards. The principles that are in place for today's legacy systems should be applied to the world of DLT as well



to ensure that positive network effects can be created and fully reaped. Against this background, there are already calls for an International Organization for Standardization (ISO) standard for DLT arrangements to help unlock their full potential by paving the ground for establishing interoperability between the offerings of different blockchain providers.

Although the industry might come up with a descriptive and detailed framework to cover these needs in a self-regulatory approach, political and regulatory guidance on a meta level might be advantageous in order to adequately steer developments. One major objective of such a regulatory initiative could be the establishment of a fair and open market model between new market entrants and incumbent payment service providers. This would help lay the foundation to make sure that best-in-class services can be offered to all market participants.

Aside from the need for a regulatory framework and a set of common and reliable industry standards, the technology itself still needs to undergo a steady process of development and improvement. Among other things, there are concerns about the scalability of the technology for usage in a mass transaction environment.

Ensuring security

Furthermore, users, application and platform providers as well as technology implementers still have to engage in a steep learning curve when it comes to the secure usage and management of arrangements based on this new technology. As the recent Eritheum Smart Contract hack demonstrated, it may not necessarily be the technology itself that could fail; problems could also arise due to the lack of experience with regard to its usage.

Finally, there is a prevailing perception that the use of DLT – as a technology connected to the internet – is free of charge or at least

available at low cost. This perception does not take into account the considerable process and maintenance cost that comes with the use of cryptotechnologies in a mass transaction context.

The 11th edition of The Global Risks Report 2016 recently issued by the World Economic Forum sees cyber-attacks on infrastructures as a Top 15 risk in terms of impact on people, institutions and economies. For transaction banking and payment infrastructures, which play a non-negligible role in the functioning of the economy and society as a whole, this means that security, reliability and trust will firmly remain at the centre of their value proposition and focus – and their protection will probably come at an even higher cost in the future. Against this background, the industry would be well advised to take a realistic and not too exuberant approach to the topic of exploring DLT as a new functional basis for these vital processes.

Thomas Egner
Secretary General
Euro Banking Association

www.abe-eba.eu



As Africa embraces mobile payments, independent financial commentator Chris Skinner reflects on the impact of digital technology on spending, and the new age of finance known as the ValueWeb

Welcome to the ValueWeb

Money originated as a control mechanism for governments of ancient Sumer to control farmers, based upon shared beliefs. It was then structured during the Industrial Revolution into government-backed institutions, banks, who could issue paper notes and cheques that would be as acceptable as gold or coinage, based upon these shared beliefs. We share a belief in banks because governments say they can be trusted, and governments use the banks as a control mechanism which manages the economy.

So now we come to bitcoin and the internet age, and some of these fundamentals are being challenged. Before we get into that though, let's just take a step back and talk about how the internet age came around.

Where it all began

Some might claim it dates back to Alan Turing, the Enigma machine and the Turing Test, or even further back to the 1930s, when the Polish Cipher Bureau was the first to decode German military texts on the Enigma machine. Enigma certainly was the machine that led to the invention of modern computing, as British cryptographers created a programmable, electronic, digital computer called Colossus to crack the codes held in the German messages.

Colossus was designed by the engineer Tommy Flowers, not Alan Turing – he designed a different machine – and was operational at Bletchley Park from February 1944, two years before the American computer ENIAC, or Electronic Numerical Integrator and Computer, appeared. ENIAC was the first electronic general purpose computer and it had been designed by the US military for meteorological purposes, namely weather forecasting, and delivered in 1946.



Chris Skinner

When ENIAC launched, the media called it 'The Giant Brain', with a speed 1,000 times faster than any electromechanical machines of its time. ENIAC weighed over 30 tonnes and took up 1,800 square feet of space. It could process about 385 instructions per second – compare that with an Apple iPhone 6, which can process around 3.5 billion instructions per second. This was rudimentary technology, but we are talking about 70 years ago, and Moore's law had not even kicked in yet.

The key is that Colossus and the ENIAC laid the groundwork for all modern computing and became a boom industry in the 1950s. You may think that surprising when, back in 1943, the then president of IBM, Thomas Watson, predicted that there would be a worldwide market for maybe five computers. Bearing in mind the size and weight of these darned machines, you could see why he thought that way but, my, how things have changed today.

Early days

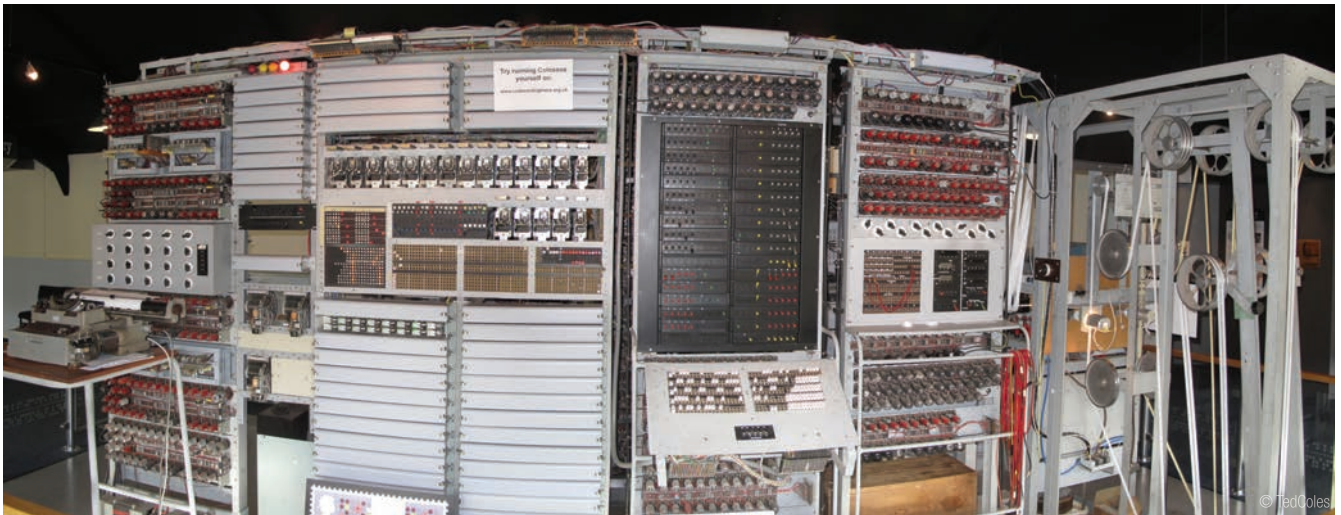
However, we are still in the early days of the network revolution and I'm not going to linger over the history of computers here. The reason for talking about ENIAC and Colossus was more to put our current state of change in perspective – we are 70 years into the transformations that computing is giving to our world.

Considering it was 330 years from the emergence of steam power to the last steam power patent, this implies there's a long way to go in our transformation. However, we can already see that a new age of money is being created in the internet age. I call this the 'ValueWeb', connecting everyone on the planet to talk, socialise, communicate and trade globally, in real time for almost no cost. I can make a Skype call for almost no cost to anyone on the planet and, thanks to the rapidly diminishing costs of technology, the cheapest smartphone in the world costs just USD 34 (~€30), for example.

The arrival of bitcoins is part of the new ValueWeb



© Leszek Soltys



A reconstruction of the Colossus digital computer at The National Museum of Computing, Bletchley Park, UK

In other words, what is happening in our revolution is that we can provide a computer far more powerful than anything before, and put it in the hands of everyone on the planet so that everyone on the planet is on the network. Once on the network, you have the network effect, which creates exponential possibilities as everyone can now trade, transact, talk and target one to one, peer to peer.

Getting connected

As we connect one to one in real time, it will create massive new flows of trade for markets that were underserved or overlooked. Just look at Africa, where mobile subscribers take to mobile wallets like ducks to water.

A quarter of all Africans who have a mobile phone have a mobile wallet, rising to pretty much every citizen in the more economically vibrant countries of Kenya, Uganda and Nigeria. This is because these citizens never had access to a network before – they had no value exchange mechanism, except for a physical one that was open to fraud and crime. Africa is leap-frogging other markets by delivering mobile financial inclusion almost overnight.

The same is true in China, India, Indonesia, Brazil, the Philippines, and many other underserved markets. The first massive change in the network effect of financial inclusion is that the five billion people who previously had zero access to digital services are now on the network.

ValueWeb

A second big change is the nature of digital currencies, cryptocurrencies, bitcoin and

shared ledgers. This is the part that is building the new rails and pipes for the fourth generation of finance, and we are yet to see how this rebuilding works out. Will all the banks be based on an R3 blockchain? Will all clearing and settlement be via Hyperledger? What role will bitcoin play in the new financial ecosystem?

We don't know the answers to those questions yet, but what we will see is a new ecosystem that diminishes the role of historical banks. The challenge for historical banks is whether they can rise to the challenge of the new system.

Africa is witnessing the increasing usage of mobile phone payments



© ALJUN/IST PHOTO/ David Mutua



© Gerd Altmann

This new age of finance, the ValueWeb, is a digital networked value structure that is real time, global, connected and near free. It is based upon everything being connected, from the seven billion humans communicating and trading in real time globally to their billions of machines and devices which all have intelligence inside. This new structure obviously cannot work on a system built for paper with buildings and humans and is most likely to be a new layer on top of that old structure.

A new layer of digital inclusion overcomes the deficiencies of the old structure – a new layer that will see billions of transactions and value transferred at light speed in tiny amounts. In other words, the new age is one where everything can transfer value, immediately and for an amount that starts at a billionth of a dollar if necessary.

Where next?

This new layer of value exchange is therefore nothing like what we have seen before. For what was there before, it will supplement the old system and diminish it. Give it half a century and we will probably look back at banking today as we currently look back at cash and barter – they are old methods of transacting, for the old historical structures of physical trade. These have now been replaced by a new method of transacting in the digital age.

In conclusion, I don't expect banks to disappear, but I do expect a new system to evolve that may include some banks but will also include new operators who are truly digital. Maybe it is the Googles, Baidus, Alibabas and Facebooks? Or maybe it is the Prosperers, Lending Clubs, Zopas and SoFis?

Peering into the future: we are only just beginning the journey into the new world of digital payments

We don't know the answer yet and if I were a betting man, I would say it's a hybrid mix of all, as all evolve to a new age of financial structures. The hybrid is one where banks are part of a new value system that incorporates digital currencies, financial inclusion, micropayments and peer-to-peer exchange because that is what the networked age needs. The networked age needs the ability for everything with a chip inside to transact in real time, for near free. We're not there yet, but this revolution is in its early days.

It's just 70 years since the first computer was built. The Industrial Revolution took three centuries to play out. Give this revolution another few decades and then we will know exactly what we have built. Whatever it is, it's not based upon money, banking and insurance. It's based on a worldwide web of value exchange. Welcome to the ValueWeb.

Chris Skinner
Independent financial
markets commentator

www.thefinanser.com
www.chrisskinner.global

Secure mobile ticketing – PayiQ®

These days you can do almost anything with smartphones. Why not use smartphones for buying travel tickets as well?

What is PayiQ®? iQ Payments has developed a mobile ticketing solution that allows smartphone users to buy travel tickets or combined travel and event tickets to, for example, the theatre and concerts. Paying for a ticket is quick, safe and easy with a free app that can be downloaded for Android, Apple and Windows phones.

Tuomo Parjanen, the CEO and senior partner of PayiQ, says that instead of SMS tickets, a real mobile application was needed that would make ticket purchasing safe and secure.

What makes your mobile ticketing solution so excellent?

First of all, the PayiQ mobile ticketing solution makes it possible to possess a variety of tickets. For example, combination tickets include public transport tickets and tickets or entrance fees to different kinds of events. We want to cover the whole travel chain and minimise the number of physical tickets needed during travel.

Tickets can be paid for with debit and credit cards or through mobile phone operators. The app creates the ticket, formulates a QR or barcode for it and sends optional monthly consolidated invoices to the customer. The application's fraud detection and risk management software prevents misuse and makes paying as safe as possible for both the user and the vendor. Our own ticket validator includes a fraud detection and identification of purchase transaction module, which can be implemented to environments that have internet access to our server and support Android, Windows Mobile or Linux operating systems.



We can guarantee that a ticket cannot be photocopied so that it would pass as a valid ticket and can only be used by the purchaser on the device it was purchased on. Our fraud detection module will immediately identify copied tickets and our validator solution for checking tickets can be installed to the payment terminals in buses, for example.

Mobility operators can modify ticket types, whilst their prices and validity appear in real time. Operators can then freely determine how their products are used.

What makes our mobile ticketing solution superior is its open interfaces that enable the app to be integrated into other systems relevant to the operator's business.

The following smart city mobility services cannot be produced with conventional ticketing systems:

- **Validation:** PayiQ can be integrated into any third party QR code or NFC scanner device. Our fraud prevention system has over 100 different parameters to check and minimise risk of fraud during the purchase or validation process;
- **Flexible interface:** The applications support HTML5-based live content. Therefore, new service combinations, ticket options, offers, route information, etc. can be updated in real time without a need for application upgrades; and
- **Combination tickets:** Combines tickets for all transportation means with optional event tickets (theatre, concerts, exhibitions and games).





How far are you now with the development of your smart mobility solution?

Our system has been in operation in Finland for 1.5 years now, covering seven cities and municipalities. In the near future, we may have train travel integrated into the system, too, as well as the long haul buses. We are actively involved in organisations and programmes such as the CityNext programme by Microsoft and the SmartCity programme by Tekes, the Finnish Funding Agency for Innovation, focusing on ‘mobility as a service’. We are also a member of the Intelligent Transport Systems Finland network.

What technologies do you use and why did you choose them?

We support Windows, Android and iOS mobile devices. Our current solution utilises QR-codes and NFC. Our back end technology consists of Python and C-code running on Linux servers and MongoDB storage. We also use Azure cache service to increase performance. We chose Azure as we wanted to achieve global reach and scalability. The fact that Azure is certified for PCIDSS, ISO 27001 security standards and ISO 27018 privacy standards helps us to create trust in our solution.

What plans do you have for the future and what goals do you have regarding internationalisation?

We want to become the leading mobile ticketing solution provider in both Finland and the world in this business sector. We have a firm belief that during the next two years over half of our revenue will come from international markets. Our focus is on Europe and North Africa with a local presence now in Spain and Morocco – a forerunner in the North African area that has recently made substantial investments in education and digitalisation. We negotiate with several companies there, and aim at launching the first proofs of concept this autumn. Currently, we have very promising openings in Belgium, Germany and Russia, too, and are heading to the Middle East next.

PayiQ[®]

Tuomo Parjanen
CEO, Senior Partner
iQ Payments

+358 500 528 295

tuomo.parjanen@iq-payments.com
www.payiq.net



With financial auditing playing a key role in ensuring that companies report financial information fairly, the World Bank Group's Jarett Decker reflects on the introduction of new EU rules

Watching the watchdogs?

Auditors are supposed to be watchdogs, making sure companies report their financial information fairly. But they are paid by the companies they monitor, and there is always temptation to please the client rather than protect the public. So who watches the watchdogs? Until now, European law allowed auditors a large role in policing their own profession.

That is about to change. On 19 June the most ambitious auditing reforms since the US Sarbanes-Oxley Act took effect in the EU. Key provisions will reduce the influence of auditors in regulatory bodies.

But implementing these changes will present practical challenges and strain budgets in some countries, particularly newer EU members and accession candidates. National lawmakers have to muster the will for meaningful reform if the push to improve auditing across Europe is to succeed.

Ensuring confidence

Until just 15 years ago, auditors established and enforced their own standards of performance and ethics through member-controlled professional bodies. The credibility of that system collapsed under the wave of accounting scandals including Enron, WorldCom and Parmalat.

The US responded in 2002 with Sarbanes-Oxley, which created the Public Company Accounting Oversight Board as an independent overseer of corporate auditing. The EU followed in 2006 with a law requiring public oversight and quality assurance inspections for auditors.

But the 2006 law allowed broad leeway. For example, auditors could serve on public oversight boards as long as they were a voting minority. And oversight boards could delegate inspections and discipline to professional bodies, as long as they retained supervisory powers. Critics complained that in some countries, oversight boards were still too dependent on the profession.

The new EU laws that took effect on 19 June will bolster their independence. Among other changes, current auditors are barred from oversight boards. Past practitioners must satisfy a three-year cooling-off period before they can participate. For auditors of 'public interest entities' – for example, listed companies, banks, and insurers – oversight boards may no longer delegate inspections and discipline to professional bodies; instead, they must take direct control.

Dealing with legacies

These reforms help assure that the fox will not guard the henhouse. But they also present challenges for effective regulation, especially in former command economies.

Auditing is difficult to regulate properly because it relies so much on professional judgement. Far from a rote application of checklists, auditing

requires understanding the company's business and management estimates to identify risks of accounting misstatement; designing tests to address the risks; and evaluating evidence with a critical eye. Technical expertise and seasoned judgement are essential.

To oversee the work of auditors meaningfully, oversight boards must have commensurate technical sophistication. While current auditors are now barred from oversight boards, appointing a retired audit partner can be one way to provide the needed expertise.

But countries that began transitioning to market economies in the 1990s have not yet developed a supply of retired audit partners who are experienced with modern standards and available for appointment. The three-year cooling-off period also complicates the appointment of retirees and other former auditors.

These countries also face challenges in hiring competent inspectors. The oversight bodies that will now conduct inspections, at least for auditors of public interest entities, are sometimes lodged within ministries subject to civil-service pay scales. These are typically too low to attract experienced auditors from leading firms, and oversight bodies will be underfunded if audit regulation is not a budgetary priority.

With commitment and creativity, these challenges can be surmounted. Oversight systems can be structured to avoid civil-service restrictions on salaries. More reliable alternatives to state budgetary funding can be devised. Advisory committees can be established to provide expertise, and specialised consultants can be hired to help with particularly complex inspections and investigations.

Fortunately, donors such as the EU institutions, Austria, Switzerland and Luxembourg are funding efforts to provide technical advice for countries implementing the new laws, including programmes in partnership with the World Bank's Centre for Financial Reporting Reform.

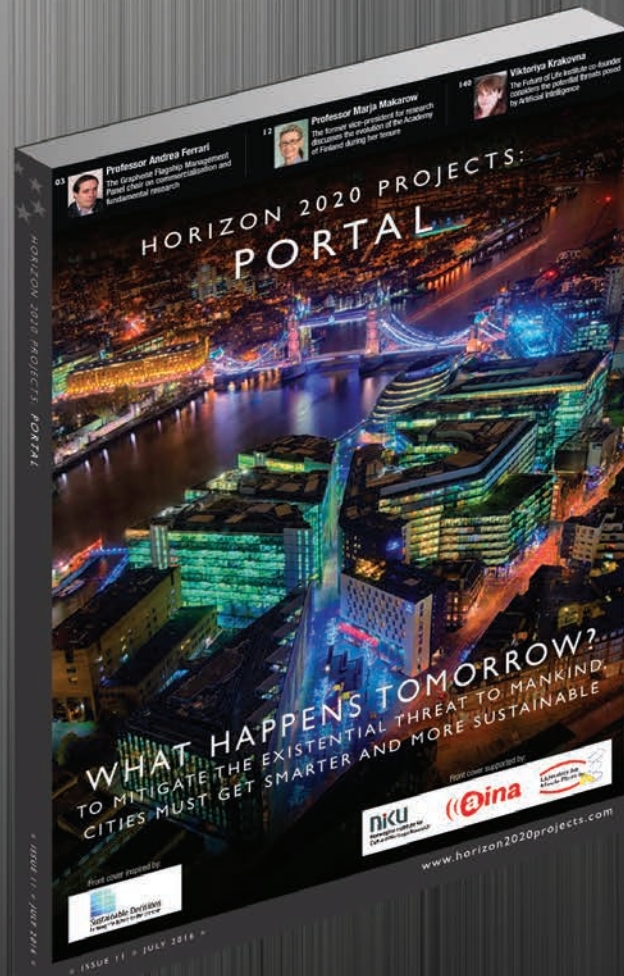
But in the absence of recent accounting scandals to focus their attention, some national lawmakers may lack the impetus to find and fund effective solutions. If so, the EU's drive to strengthen audit oversight could yield uneven results.

Jarett Decker
Head
World Bank Centre for Financial Reporting Reform

<http://web.worldbank.org>



HORIZON 2020 PROJECTS: PORTAL



Horizon 2020 Projects: Portal is the invaluable quarterly digital publication for policy makers, scientists and researchers involved in the EU's largest ever RDI run-on investment programme.

The publication features exclusive interviews and articles from top European politicians as well as leading scientists undertaking Horizon 2020-funded research in their fields of expertise.

Portal can be accessed via horizon2020projects.com, which offers daily news updates and articles on the latest developments in the framework programme.

Published in July 2016, key contributors to the tenth edition of Portal included:

- Andrea Ferrari –The Graphene Flagship Management Panel chair;
- Marja Makarow –The former vice-president for research; and
- Beat Späth –The director for agricultural biotechnology at EuropaBio.

Issue 12 of Portal will be published online in October 2016.



UK tel: +44 (0)1260 273 802
Brussels tel: +32 (0)249 403 57
email: info@horizon2020projects.com

www.horizon2020projects.com

With a theme of 'Investing for a greener future', Pan European Networks reviews Green Week 2016 with the public remarks of European environment commissioner Karmenu Vella

Green investment, green future

Green Week, the EU's largest environmental policy event, was held earlier this summer as the continent sought to invest 'for a greener future'. Rather than simply focusing on monetary investments, according to the European Commission, the five-day event highlighted the key priorities of creating jobs, reducing unemployment, improving the cleanliness of the air, avoiding waste and 'using raw materials and resources more efficiently', amongst others.

More than 180 Green Week partner events took place in 31 countries across Europe from 30 May to 3 June 2016, with over 140,000 people participating in addition to the hundreds of thousands who took part online.

Each day of Green Week 2016 focused on a particular aspect related to 'Investing for a greener future'. The first day assessed how putting money into greener cities can help to realise a better quality of life in urban areas. This was followed by evaluating ways to 'secure our future through investments in the countryside' and locating the funding necessary for society's requirements.

The penultimate day centred on funding ocean research, whilst the final day saw debates move to a more global level, notably discussing investment 'in sustainable development for future generations'.

The highlight of the week came on 1 June, when Brussels hosted a high-level conference entitled 'Investments that make it happen: How to green the financial system?'. Speaking at this event was Karmenu Vella, European commissioner for environment, maritime affairs and fisheries.

Environment and the economy

In his initial address at the high-level event, Vella emphasised the importance of environmental policy "to the efficiency and competitiveness of the whole of our economy" and, *vice versa*, the importance of economic policy "to the wellbeing of our environment and to sustainability". As a result, the commissioner said, there are strong ties between the environment and the economy.

He stated: "We have to accept that reality because the environment is one thing we can't hide from. It will always come back to us. Environment policy has to face that truth; it has to head off problems before they arise. That's why environment policies are policies for the future."

"Our future will have to be based on a low carbon and resource efficient economy – on living within planetary boundaries: we don't really have any choice. That means that the real finance agenda is the green finance



Vella highlighted how the economy of the future would be one that is low carbon and resource efficient

agenda. We need new sources of long-term, sustainable investment."

During his speech, Vella also drew attention to examples of how capital, including from the European Fund for Strategic Investments, can be used by companies to help achieve the EU's sustainability goals: "Grinkgo is using the EFSI to leverage investment into cleaning up brownfield sites in urban areas in France and Belgium. Brownfield sites are usually polluted industrial sites which may be costly to clean and need investment. But they also tend to be situated in prime urban spaces, so they have great economic potential.

"By tackling these sites, Grinkgo should create around 5,000 housing units and more than 8,000 jobs – investment that is good for growth, good for jobs and good for the environment."

The commissioner added there is now the challenge of ensuring that those outside of the environmental arena take action, notably those working in private finance. However, there would be benefits for all: "Financing has to evolve with the world around it, and the changes we are witnessing include climate change, limits to the availability of fossil fuels, phosphates, land, and protein, population and consumption growth, and increasing

competition for raw materials. So making our financial systems sustainable is not just green, it pays dividends.”

Getting the money

In a second speech to delegates as part of the high-level Green Week conference in Brussels, Vella described finance as a “vital component” in realising a green economy, stressing that current circumstances are unsuitable.

“If we don’t make financial markets more sustainable, they will continue to be at risk. This is what environmentalists tell us, and it is what economists tell us.”

Yet despite this challenge, Vella declared his optimism as a result of the conference, citing the quick growth of green and sustainable finance, and how the EU is playing its role through public finance. There is an increasing need to consider the environment when individual firms take decisions as well as within the investment chain. Vella also gave credit to policy makers in helping to advance the environmental agenda, particularly as they offer “a clear and predictable regulatory framework”.

“People need to be told that green investment has a positive impact on job creation,” Vella informed delegates. “The environmental goods and services sector is one of Europe’s great success stories.”

Optimistic heart

The commissioner also highlighted how special financial measures are needed for circular economy systems and that the EU is making funding available through the EFSI, for example.

“Leveraging private finance into greener solutions is the best way to overcome market failures,” the commissioner said



Green dividends

Following the conclusion of Green Week 2016, Vella provided his thoughts on the events in a personal blog post.

‘Investment is a key element in moving to a circular and low carbon economy and to help achieve the commitments made last year in New York on the Sustainable Development Goals and in Paris on climate.

‘The transition to a circular economy, kick-started by our Circular Economy Action Plan, will require significant funding from public and private sources as well.

‘The idea of a ‘trade-off’ between the economy and the environment is outdated. Our future will be built on investment that integrates economic opportunity with sustainable environment practice.’

Vella noted the benefits of investing in green cities as it helps to ‘create jobs, a healthy environment and better quality of life’. Meanwhile, he acknowledged, for the countryside to remain ‘healthy and productive’ in the future, the application of sustainable farming practices would be vital.

The commissioner highlighted how the blue economy is also a strategically important area. He commented: ‘Investments in a sustainable blue economy will ensure that our oceans are healthy and productive in the long run.’

In addition, Vella emphasised that the EU is spearheading moves towards a sustainable environment, including a pledge to realise the 2030 Agenda for Sustainable Development both within Europe and across the world, adding that it is important to ‘mobilise all available means and resources’.

Attention was also drawn to the importance of green investment and its ‘positive impact on job creation’, including the role of the European Fund for Strategic Investments in helping to realise a sustainable and circular economy.

‘EU Green Week has brought many insights and inputs for our further work,’ Vella concluded. ‘I hope you will join our efforts to ensure that these conclusions and recommendations will now be taken up and brought concretely to action in view of investing for a greener future.’

The Capital Markets Union Action Plan would also play a role, he added, emphasising the importance of collaboration.

“Change is already happening. We can see the sort of financial system we need, and we can see efforts to get there happening around the globe. The challenge is going to be scaling up those changes, pushing the system over the threshold. We need the momentum to take hold so that progress becomes self-sustaining.”

Vella is clearly positive with regards to the further development of a green economy. With benefits now outshining the drawbacks along with the availability of monetary resources, the EU’s further realisation of a green future is very much in sight.

PEN interviews the head of the European Commission's Directorate-General for Climate Action (DG CLIMA), Jos Delbeke, on the work being done to confront the climate challenge

European climate agenda

Europe has long been a leader on addressing climate change, with the Directorate-General for Climate Action (DG CLIMA) leading the European Commission's efforts to confront it in Europe and around the world. With the landmark Paris Climate Agreement being signed at the UN in April of this year, the commission has called for swift ratification to confront the common challenge of climate change that mankind faces.

Leading DG CLIMA is Jos Delbeke, who on 23 May was a key speaker during a European Policy Centre policy dialogue; 'De-carbonising the economy – The ICT factor'. Sitting down with PEN on the sidelines of the event, Delbeke provided an insight on EU activity and work taking place in the area, detailing how Brussels and the EU is translating the ambitions under the Paris agreement into concrete action, taking forward work on climate change.

While Europe has been doing well in meeting its climate targets, some have called for more ambitious goals. Given how well Europe has done so far, how is the DG working to move forward in the area?

What we have to do as a first task is to put into legislation the goals that were fixed or agreed by consensus by the heads of state under the European Council. How much we may see as regards scope for more ambition here or there, the preparatory work that we are doing today with all players, and not least with member states, indicates the scope for additional work that we can pursue.

So legislation first and foremost, once that is finalised, then we can look at the evidence and see how much the new realities are kicking in. While oil prices are down today, they may be higher in the future. Other countries are doing a lot of work on climate action, and over time we are seeing technology evolving. The first priority at the DG is to develop the legislation

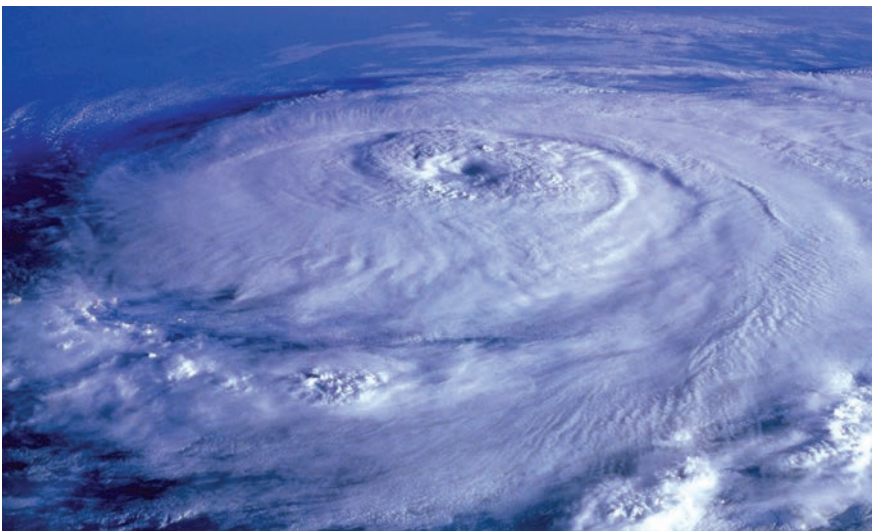
based on what the heads of state have decided. Once that process is complete, we can prepare the ground for the next step; and that approach is exactly in line with what was agreed in the Paris agreement.

Under the agreement, we have a five-year review cycle. So the first part of the cycle is to adopt our legislation, implement the Intended Nationally Determined Contributions [national commitments to post-2020 climate actions]. For us, the implementation of the INDCs is the adopting of EU climate legislation, so as to be sure we deliver those targets.

In terms of renewable energy, Europe has done very well in rolling out such forms of energy generation. But much of European energy generation is still reliant upon traditional fossil fuels. Considering the greening of these forms of energy through technologies such as carbon capture and storage (CCS) what are the commission's work priorities here?

On CCS we would be very prepared to do much more and we have the dedicated funding in place. What we saw was that the private sector was not following through with projects. While there may be good news out there and it is a technology that we are going to need in the future; the bulky sum that is necessary to have this carbon capture and storage rolled out in private industry has become a major hurdle.

Collecting the €500m, or even up to €1bn or more, that is needed to build such a working facility of course represents quite lot of money, particularly when you compare the cost of CCS to renewables and consider that a form of renewable energy, be it a windmill or solar panel, renewables appear much more attractive. That is why when it comes to CCS we are ready to play ball; but we cannot play ball on our own. It should also be a private operator putting some risky capital aside to invest alongside our funds.





In terms of trying to address risk around CCS and make investment more attractive, is there the scope to bring in the European Emission Trading Scheme (ETS) to take better account of innovation happening in the area?

This could be. The ETS is already proving to be a strong help when it comes to coal or lignite electricity production. Combined with CCS, that would make the case for coal or lignite production quite significant, not only in the short but also in the long-term.

In terms of the wider financial streams to try and promote innovation around climate action, could existing EU schemes such as the Horizon 2020 framework programme or the European Fund for Strategic Investments play a greater role to drive forward investment and innovation?

Exactly, and we also have an innovation fund as part of the ETS. We are looking into ways that we can use that money in line with the Juncker fund and European Investment Bank. This will help them roll out interesting projects and cover the risk factor. Indeed, we are still seeing the private investors coming forward with their investment proposals.

In the wake of the Paris agreement, how has the way the commission goes about its business in terms of the climate agenda changed? Has it energised your work here? Has it been a game changer?

It has, and actually when it comes to mainstreaming climate policy it is the Paris

agreement that makes a tremendous difference in two or three respects. For example, the work we are now doing with DG AGRI on agriculture and forestry is very new, not that we weren't talking with them in the past, but it's now much more operational in what we should be doing in terms of policy and action.

For example, with DG Energy, we are looking much more closely at energy transport issues; also we are working with DG Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) on investment and economic issues. One further element where we are increasing works is over international support. The partnership agreements that we at DG CLIMA are signing, the European External Action Service are signing, our colleagues in DG Development and Cooperation are signing, underline this. I think our standard of having a climate and energy clause in our international co-operation agreements is significant. This is an area where the Paris agreement has changed work for the better quite significantly.

It's no longer a question of if we should be involved in climate action, but what should we be bringing to the issue. The question over the climate has dropped, and we are seeing clear ambitions being made under the G7 and G20; this is really a game changer.

Is it important to link in climate action to the Sustainable Development Goals?

That should facilitate work tremendously indeed. We have always worked like that but, since Paris, there has been the recognition that we have these ambitious targets that we have to act on and have more mainstream work, making it necessary to review our traditional policies, all to a much more significant degree than what was happening before.

Jos Delbeke
Director-General
The Directorate-General for Climate Action (DG CLIMA)
European Commission

<http://ec.europa.eu/clima>



Speaking to PEN, Norway's minister of petroleum and energy, Tord Lien, details how the country is working to explore the potential of carbon capture and storage

Norway's CCS leadership

IT was an "important day" for Norway, according to the country's then leader Jens Stoltenberg. In 2012, the prime minister visited the Mongstad industrial site in western Norway to open what he described as "the world's largest and most advanced laboratory for testing carbon capture technologies", an illustration of the country's pioneering efforts in carbon capture and storage technology (CCS). According to the government, CO₂ Technology Centre Mongstad 'bridges a gap in the technology chain by enabling testing capture technologies on an industrial scale'.

Four years later, Norway is continuing to push the boundaries of CCS research and demonstration. The government places significant emphasis on the importance of CCS, in particular the development of new technology and realising a reduction in related costs. In 2014, Oslo restated its commitment and emphasised the importance of CCS by setting the ambition of establishing at least one full-scale CCS demonstration facility by 2020.

To find out more about Norway's ventures into CCS technology, PEN spoke to Tord Lien, the country's minister of petroleum and energy, who discussed how Oslo is helping to encourage financial investment in CCS, the importance of realising collaboration between the government, industry and overseas national partners, and the relationship between CCS and the EU Emissions Trading Scheme (ETS).

What is the background to Norway's CCS strategy?

Our strategy consists of several elements, and has done so for many years. Basically there are three legs – research, demonstration and



Tord Lien

testing of technology, and broad scale utilisation of CCS. The efforts we have made reflect that CCS is a longstanding commitment for Norway.

We have a strong industrial research tradition. Much of the experience we have achieved in the development of the oil and gas industry is relevant for CCS.

Now we focus on utilising that competence and knowhow for new CCS technologies.

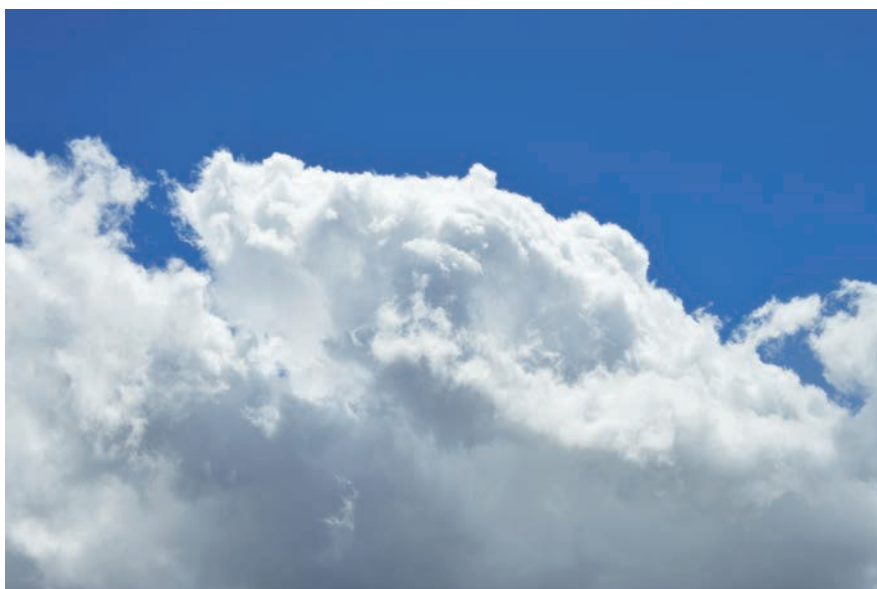
Research is also related to the second area; demonstration and testing. CO₂ Technology Centre Mongstad is the largest and most advanced test facility for CO₂ capture technology in the world. The facility has, according to the vendors, qualified several capture technologies for use on a full industrial scale.

We have two Norwegian CCS projects in operation – they comprise the only large scale plants in operation in Europe. On the Sleipner field in the North Sea, CO₂ has been captured and stored under the seabed for almost 20 years. The other project is located in the high north of Norway, on the Snøhvit field. In addition, we are currently evaluating the possibility of CCS for onshore industrial ventures.

What is the core motivation for developing CCS technology?

Norway is a small country. Even if it ceased emitting CO₂ altogether, the efforts made won't have any significant difference on global emissions.

The core motivation for our CCS strategy is to establish CCS as a cost-efficient climate measure. Fighting climate change is definitely going to come at a significant cost, but in order to keep that cost as low as possible, CCS has to be utilised – and the cost for CCS has to be brought down. Of course, Norway can't do this alone, even though we are a rich country and possess the relevant technical





**The Mongstad
technology centre**

expertise. It is therefore an essential part of our strategy to play our role in a global co-operation, and help bring down the cost of CCS to a level where this technology can be utilised globally.

How is the government encouraging investment in CCS?

For the development of CCS technologies and for the first demonstration projects onshore, the financial contribution from the government is substantial.

Industry in Norway is part of the ETS, but is also hit by a significant CO₂ tax. Industry pays a tax of up to around NOK 500 (~£38) per tonne of carbon dioxide. This tax level has been instrumental for the realisation of the two Norwegian offshore CCS projects.

Polluting industry, located anywhere in the world, will meet increasing costs of emitting CO₂. As a result, industry will be incentivised to capture and store carbon dioxide.

How does Norway see CCS playing a role in meeting its COP21 commitments?

Along with EU member states, Norway is committed to reaching climate targets. We have, together with the EU, decided on a reduction in CO₂ emissions from industry and other sectors, and this already forms part of the ETS.

In the long run CCS will play a role in helping us meet our climate commitments.

How is Norway seeking to take advantage of other EU member states who are possibly reducing their investment in CCS?

Ten to 15 years ago, there was the consideration of having more than ten full-scale CCS facilities in Europe. We currently only have the two Norwegian projects. Whilst on the one hand you can be disappointed, on the other hand, we have to acknowledge that CCS is challenging.

If we focus on the positive signs, I observe that the Dutch ROAD project is moving ahead. I also think that the new SET plan is very encouraging.

How important is working with industry in realising CCS?

Working with industry is vital. The government can offer support, but the industry must develop the specific solutions. The development of CCS is too costly for the industry to undertake alone – they are going to need government support until there is a better balance between market incentives and costs.

Through working with other national governments, including EU member states, Norway has contributed with measures to support CCS projects, from research and development to full scale. Co-operation between industrial players and collaboration between industry and governments is of course also essential.

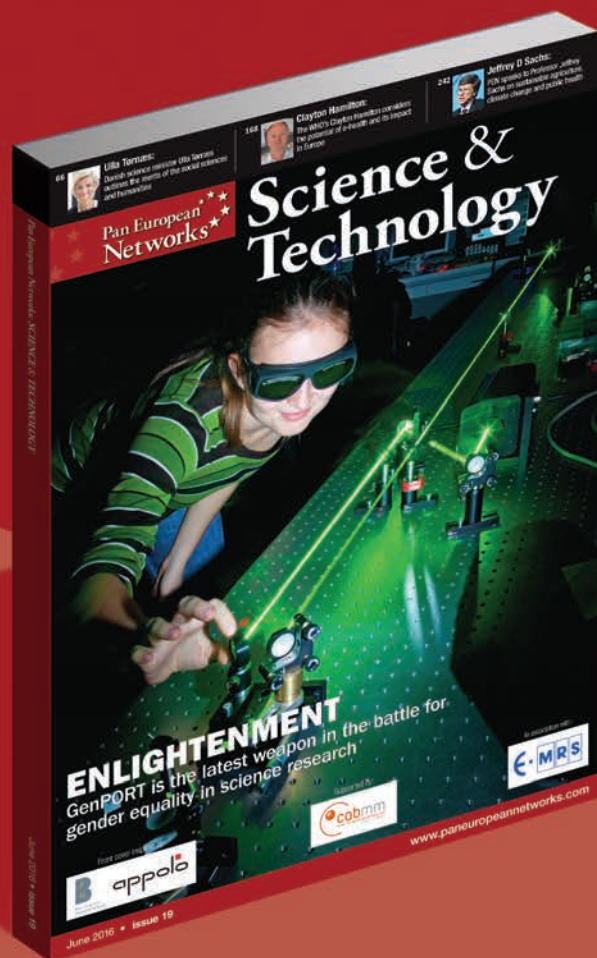
Norway really appreciates the co-operation it has with the US Department of Energy on CCS, and this is in addition to co-operation with both the Netherlands and the United Kingdom, amongst others.

Tord Lien
Norwegian Minister of Petroleum and Energy

<https://www.regjeringen.no/en/dep/oed/id750/>

Pan European Networks:

Science & Technology



PAN EUROPEAN NETWORKS: SCIENCE & TECHNOLOGY

Bringing together leading voices in the European scientific community alongside contingent analysis, PEN: Science & Technology dissects the current trends in science.

From the latest breakthroughs in research to the implications of scientific achievement and the important supporting frameworks that drive European science forward, the publication considers the entire scope of scientific endeavour. In covering the geographic breadth of Europe, the journal casts light on scientific insight and discovery from across the union.

Published in June 2016, key contributors to the 19th edition of Pan European Networks: Science & Technology included:

- Ulla Tørnæs – Danish science minister;
- Clayton Hamilton – The WHO Unit Leader, E-health and Innovation; and
- Jeffrey D Sachs – Director of The Earth Institute, Columbia University.

By not only looking at how science is changing our understanding of the world, but also how it is enabling us to transform society, the economy and even our perceptions of the human condition, PEN: Science & Technology helps to both elucidate the current issues and highlight the indispensable role of scientific and technological innovation in Europe today.

Pan European
Networks

Highlighting developments in Europe – and focusing on the UK – Andrew Purvis from the Global CCS Institute outlines how carbon capture and storage technology is set to aid climate action ambitions

Climate contribution

In December 2015, the climate agreement reached by 197 countries at the 21st Conference of the Parties in Paris set out an objective to limit temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to reach a 1.5°C limit. In order to fulfil its commitment to the Paris Agreement the EU would have to strengthen its efforts in cutting carbon dioxide (CO₂) emissions through the implementation of more ambitious climate and energy legislation. Together with the European Union's Emission Trading Scheme (EU ETS) directive, more policies are currently in a reform process in the EU. To achieve the climate target of 'well below 2°C', all available climate change mitigation tools need to be strongly supported.

The Paris Agreement foresees that each country pledges to make a contribution to greenhouse gas reduction in the context of their national priorities, circumstances and capabilities. These national pledges, initially known as intended nationally determined contributions (INDCs), were submitted prior to the COP21 meeting and will be revised every five years after 2020, with revisions initially due in 2025.

Carbon capture and storage (CCS) is a set of technologies that reduces CO₂ emissions from power generation and industrial sectors by capturing the CO₂ directly from the plant or factory and permanently storing it underground. CCS is a proven technology, with the first large-scale CCS projects commencing operation in the 1970s. CO₂ captured from natural gas processing plants in southern Texas was first used in a process known as enhanced oil recovery (EOR).

Globally, CCS is currently utilised in 15 large-scale operating projects that have the capacity to capture 28 million tonnes (Mt) of CO₂ per year.

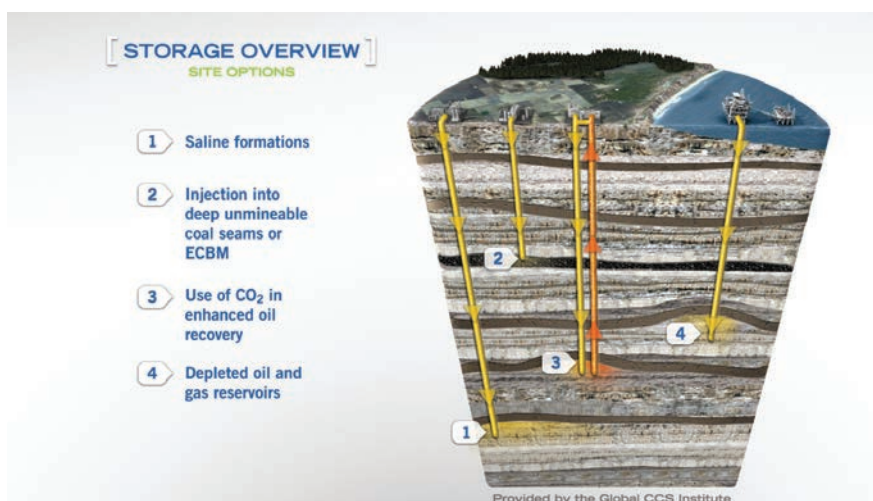
The UN's Intergovernmental Panel on Climate Change has concluded that CCS is essential to tackling climate change in the most cost-effective way. In a report released in November 2014, the IPCC highlights that without CCS the cost to limit global temperature rise to 2°C would increase by 138%.

Necessary technology

CCS is vital in a portfolio of low carbon technologies to tackle climate change at the least cost to the world economy. The International Energy Agency (IEA) recognises CCS will make a major contribution to total CO₂ emissions reductions required by 2050. The IEA in its 2016 Energy Technology Perspectives report estimates that CCS has the potential to deliver 12% of the cumulative CO₂ emissions reductions the 2°C scenario requires through to 2050. However, while the world needs CCS to achieve a low carbon future, CCS needs much more policy and regulatory support to achieve its full potential.

While all mitigation technologies will be needed to achieve this ambitious goal, in a 1.5°C scenario, CCS will need to make a significantly larger contribution. Current projections indicate more than 2,400 new coal-fired power stations are already planned for construction by the year 2030, while hundreds of existing facilities will still be in operation for the coming decades. Even if unabated coal power was to be replaced with unabated gas, CCS will be required to limit greenhouse gas emissions sufficiently to meet climate targets.

Outside of the power sector, one-quarter (25%) of the world's CO₂ emissions result from the industrial sector, in industries such as iron and steel, cement, chemicals and petrochemicals, and fertiliser manufacture. CCS is the only technology available capable of delivering



significant reductions in greenhouse gas emissions from these industries.

CCS development in Europe

In 2007 the European Council agreed to an EU goal of up to 12 large-scale CCS demonstration projects by 2015, which were meant to be supported through the New Entrants Reserve (NER300) funding mechanism. NER300 was funded through the sale of 300 million carbon emission allowances in the EU ETS. The price of EU allowances (EUAs) in the EU ETS dropped from almost €30 per tonne of CO₂ in 2008 to less than €5/tCO₂ in mid-2013, causing a substantial reshaping of the available funds for CCS projects included in the NER scheme. The UK-based White Rose project was the only CCS project to be awarded up to €300m through the financial mechanism.¹

Currently, there are six CCS projects across Europe in different stages of development. This tally includes two Norwegian projects that are actually operating, one of which will achieve 20 years of operation in 2016:

- The 'Sleipner CO₂ Storage Project' was the world's first demonstration CCS project for a deep saline reservoir and started operating in 1996. The project installations process gas and condensate from the Sleipner East and Sleipner West fields (and tie-ins from a number of satellite fields). The Sleipner project has captured, injected and stored more than 16Mt of CO₂ in the Utsira storage formation since 1996, and is located in the central North Sea;
- The 'Snøhvit CO₂ Storage Project' is a liquefied natural gas processing development in the Barents Sea off the coast of Norway. The project is designed to capture 0.7Mt of CO₂ per year when at full capacity and has stored as much as 3Mt of CO₂ since injection started in 2008; and
- The 'Rotterdam CCS Demonstration Project (ROAD)' involves the retrofit of a 250MWe post-combustion capture and compression unit to a newly constructed 1,070MWe power plant located within the Rotterdam port and industrial Zuid-Holland area. The ROAD project plans to capture 1.1Mt of CO₂ per year and to store it in a depleted gas

Andrew Purvis



reservoir under the North Sea. The Dutch project is in the defining stage of development planning, and its next step is to make a final investment decision (FID).

Development of the Sleipner and Snøhvit projects was encouraged through a CO₂ tax the Norwegian government has implemented on a number of sectors (including offshore petroleum production) since 1991. In 1996, the first year of Sleipner's operation, the CO₂ tax on offshore petroleum production on the Norwegian Continental Shelf was around USD 35 (~€31) per tonne of CO₂. This tax was raised to around \$70 per tonne in 2013, and in July 2015 the exchange rate between Norwegian currency (Norwegian krone – NOK) and US dollars modified the tax value to around \$50 per tonne of CO₂.

The EU ETS is currently under the EU institutions' review – that is, the European Commission issued a legislative proposal for phase four of the EU ETS directive in July 2015. The proposal includes an innovation fund, known as the NER400, which extends the existing support (NER300) for the demonstration of innovative low carbon technologies such as CCS and includes measures to decarbonise industrial production. The fund will be filled by selling 400 million allowances of the free allocation portion of the fourth ETS phase (2021-2030). The financial mechanism will also include 50 million unallocated allowances to supplement existing resources before 2021.

The EU institutions have the opportunity to support CCS through the EU ETS revision, which could also be broadened as suggested in the draft report proposal of the MEP Ian Duncan. As rapporteur for the EU ETS review file in the European Parliament Environment (ENVI) Committee, Duncan issued a draft proposal that foresees an additional 150 million allowances on top of the 400 million included in the innovation fund. As CCS development entails large up-front investments and long development times, Duncan's proposal represents a very positive step for the CCS sector.

Nevertheless, a funding gap exists between the current financial mechanism and NER400. While the 50 million allowances would help to support CCS until the innovation fund becomes available, larger financial support is needed before 2020 to create the necessary transport and storage infrastructure for CCS to fully contribute to reaching the EU climate targets.

UK CCS sector prospects

The UK is among the most promising European countries in developing and deploying CCS. The country currently hosts three projects in development planning – the Caledonia Clean Energy Project, the Don Valley Power Project and the Teesside Collective Project:

- Summit Power, developer of the Caledonia Clean Energy Project, intends to build a new 570MW integrated gasification combined cycle (IGCC) power plant in Grangemouth, Scotland. The proposed IGCC plant, equipped with carbon capture technology, is meant to capture 3.8Mt of CO₂ per year. The captured CO₂ would be transported to, and stored in, the central North Sea in an offshore injection site. In March 2015 the Caledonia project was awarded £4.2m (~€3.3m) in joint funding from the UK and Scottish governments for industrial research and feasibility work;
- The Don Valley Power Project (DVPP) would consist of two Sargat Stargate 250 IPCT units generating approximately 520MW of electricity. As much as 1.5Mt of CO₂ per year would be captured from the pressurised system; and
- The Teesside Collective is an infrastructure project developed by a cluster of industries in the northeast of England that aim at establishing a CCS-equipped industrial zone. The Teesside area is home to five of the UK's major CO₂ emitting plants, and its industries are responsible for 5.6% of total industrial emissions in the UK. The project would remove up to 5Mt of CO₂ per year in the 2020s.

The three projects are all in the evaluation stage of development planning. At this stage, a project examines a range of options to determine the business viability of a broad project concept. Development of these projects, and the transport and storage infrastructure to support them, would bring major benefits to both the UK economy and to the countries' efforts to meet ambitious emissions reduction targets. A recent economic benefit analysis of the Teesside process industries alone has shown that it could contribute as much as £26bn to the national economy. A study published by the Energy Technologies Institute (ETI) in 2015 estimates that a failure to deploy CCS in the UK would mean almost doubling the

cost of carbon abatement to the UK economy from around 1% to 2% of GDP by 2050.

CCS can reduce carbon emissions from both power generation and industrial applications. The UK has committed to a reduction in emissions of at least 80% in 2050 (as against 1990 levels), which, according to the UK Committee on Climate Change's 'Central Scenario' (the scenario that they have used to create the proposed fifth carbon budget for the UK government), requires a development of up to seven gigawatts (GW) of CCS within the power sector with additional investment in emissions reductions within the heavy industry sector by 2030 in order to be met. The ETI also highlights that enabling CCS to realise its potential to help decarbonise the UK economy would require a capital investment of around £22-31bn to build the sector over the period to 2030. Delaying development of CCS infrastructure could double the cost of reaching the UK climate change targets.

Notwithstanding the cancellation of the UK CCS Competition in November 2015, the Contract for Difference (CfD) concept could still be used to support electricity generation using CCS. The CfD could provide CCS project developers with an incentive to invest in the technology, but the risk of capital up-front investment of a CCS project needs to be mitigated with stable long-term policies and financial assurances. The UK Department of Energy and Climate Change (DECC) is currently examining the UK's re-oriented approach to CCS, which should take into consideration the financial risk involved in developing large-scale CCS projects and consider options for supporting industrial CCS and the creation of CO₂ transport and storage infrastructure.

¹ In April 2016 the White Rose Project was cancelled following the UK Secretary of State decision not to grant the development consent order for the project.

Andrew Purvis
General Manager Europe Middle East
and Africa
Global CCS Institute

www.globalccsinstitute.com



Capacity building for delivering low carbon economies

Dr Ward Goldthorpe, managing director of Sustainable Decisions Limited, discusses the importance of building the right institutional capability for delivering sustainable low carbon economies

Climate mitigation efforts that lead to deep decarbonisation will involve the scaling up of low carbon technologies with new network infrastructure. Examples include the capture and sequestration of industrial carbon dioxide emissions, regional combined heat and power networks, hydrogen transmission and distribution for both space heating and transport fuel, and electric vehicle recharging facilities, to name some high profile ones. The development and operation of this infrastructure as a commercial service at such a large scale is not just an engineering challenge; a substantial amount of new public and private sector institutional capability is needed to successfully progress deployment at the rapid rate necessary to achieve emissions targets in only a few decades. This is the case in all industrialised developed and developing countries alike.

Novel technologies, infrastructure, commercial structures and regulations all require new governance, consenting procedures and policy frameworks that public sector institutions will have to learn and apply as key enablers of investment, and which the private sector needs to be familiar with to undertake investment. The process of decarbonisation in a time-constrained economic system cannot rely on conventional market dynamics, and requires interplay between government intervention that makes non-commercial infrastructure investible and private sector expertise to deliver individual projects.

Building capability

Typically, governments, central banks and multi-lateral agencies look at the process of capability building in a linear fashion that parallels the 'commercialisation' process of new technologies. Fig. 1 summarises this process, wherein a new 'non-commercial' technology is assisted by policy measures and government

subsidies or other incentives through research and development, and a period of demonstration, to become a competitive market-bearable investment choice.

Each of the phases shown is accompanied by the acquisition of expertise and the institutionalisation of regulatory, permitting and financing processes that become repeatable as the technology or economic sector matures. Of particular note is the focus on the one technology or sector and its specific market failures and investment barriers, rather than on the economic system feedbacks that occur through interactions between the technology/sector and others. An excellent example of this process has been the development, commercialisation and cost reduction of rooftop solar panels in mature energy markets. Institutional capability has grown along the way as the combination of policy and technology development has driven down costs for consumers and increased take-up rates.

Rapid renewable energy deployment has demonstrated, however, that interactions with other activities such as electricity system back-up, energy intensive industry, space heating and transport need to be managed in an holistic way if decarbonisation of the economy is going to be progressed at the least cost to the community. Climate and energy policies have to be combined into a single decarbonisation policy portfolio in order to prevent new economic externalities, market failures and barriers to achieving economies of scale with new infrastructure types.

The urgency now faced for delivering climate targets means that a different focus for capacity building tailored to this holistic decarbonisation approach has to occur. Governments and public sector institutions have to develop or enhance capability for:

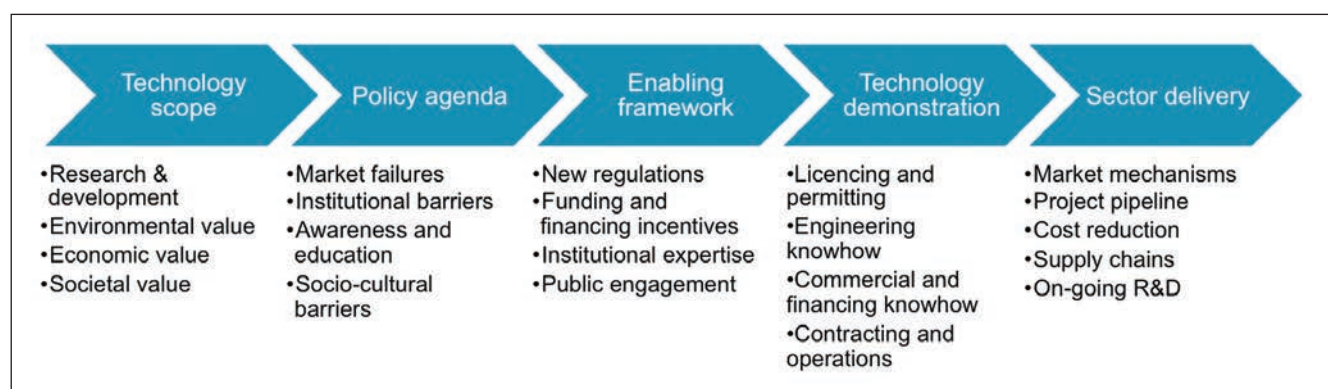


Fig. 1 Technology or sector-based capacity building

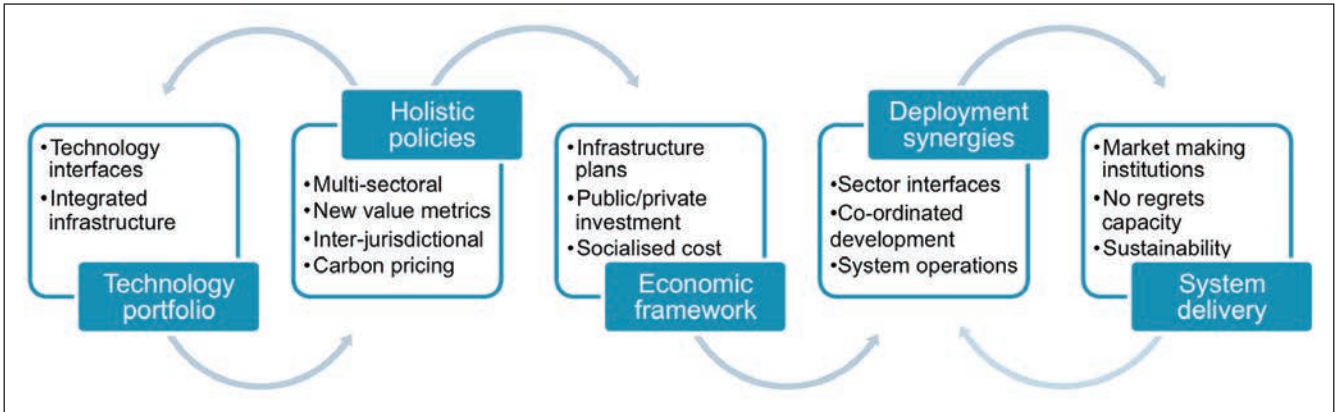


Fig. 2 System-based capacity building

- Delivering systems and networks, not projects;
- Creating integrated infrastructure synergies;
- Designing and actively managing national/regional decarbonisation plans;
- Valuing combined macro-economic and environmental benefits; and
- Decision making and support for innovation in policy and investment models.

In simple terms this means being able to answer the question: how should government prioritise and efficiently deliver the low carbon infrastructure projects that create the greatest impact in terms of economic growth, social benefits and environmental sustainability?

Fig. 2 shows the dynamic process of managing the decarbonisation of the economic system. The capability to do this includes the active management of two critical feedbacks. The first is between innovative holistic policy formulation and new technology development to ensure an optimal portfolio of real decarbonisation solution options is available. The second is between delivering the ‘no regrets’ infrastructure and maximising synergies within and between sectors through co-ordinated development. In practice, public sector institutions are needed that consider the ‘bigger picture’ and seek opportunities for greater inter-linkage between infrastructure networks of different types.

Collaboration is key

The capability to transform high carbon economies to low carbon ones may sound like central planning and state intervention. However, at the heart of achieving this transition is the need for collaboration between the public and private sector. Many of the changes in the economy require investment in infrastructure projects ahead of a market demand for the more expensive low carbon alternative to business as usual.

The economic framework that governments set up for managing this will act as a key enabler or barrier, depending on its effectiveness. Because decarbonisation is for the public good, and addressing climate change is essential to prevent destruction of both economic and natural capital – the planet’s common wealth – socialising the cost should be seen as a matter of principle. Once socialisation of costs is incorporated in the economic

framework for decarbonisation it becomes possible to accelerate deployment of infrastructure through public private risk sharing and investment models that enable private sector organisations and financial institutions to do what they do best – efficiently deploy capital and deliver operating projects.

Sustainable Decision’s mission

At Sustainable Decisions Limited our mission is to help accelerate this transition through capability building and support for policy and investment decisions targeted at the infrastructure development required to create sustainable cities and industrial regions. This involves understanding how real projects are delivered. The key personnel at Sustainable Decisions, along with our strategic partners, have many decades of practical experience in business development and large scale project delivery in unusual policy, market or regulatory environments around the world. This experience has provided the grounding for innovative techniques to support policy formulation, decision making and investment.

We provide advisory services to public and private sector organisations using innovative techniques, methodologies and tools in valuation and decision support that are based upon an understanding of complex evolving systems combined with an holistic synthesis of the technical, commercial, financial, legal and environmental actions for physical delivery of new facilities and networks. In addition to these services we also undertake bespoke research as well as training to build enduring institutional capacity for our clients.



Sustainable Decisions
Linking the future to the present

Dr Ward Goldthorpe
Managing Director
Sustainable Decisions Limited

info@sustainabledecisions.co.uk
www.sustainabledecisions.co.uk



Following on from the historic Paris Climate Agreement, Pan European Networks looks at the continent's plans for the future of renewable energy

Clean for a day

The energy sector is among the largest contributors of greenhouse gases to the atmosphere in Europe, and after the Paris Climate Agreement, many countries are turning to renewable energy sources to reduce these gases and combat global warming. In 2013, some 57.2% of total greenhouse gas emissions in Europe were due to fuel combustion and fuel emissions, down only five percentage points since 1990. The development and use of more sustainable energy sources is paramount to the fight against global warming as the energy sector remains the primary contributor to climate change, ahead of transport, agriculture and industry. Europe is already at the forefront of innovation in the low carbon energy field, but individual nations vary broadly in their uptake of new technologies and ecofriendly energy sources.

The EU's commissioner for climate action and energy, Miguel Arias Cañete, spoke about enabling a transition to low carbon energy at a public session of the Environment Council in Brussels, Belgium, in March. The commissioner urged that a framework be created for a transition, ensuring that all member states are able to fulfil their COP21 pledges and that new standards for renewable energy are created: "Being in the lead on the drive towards a low carbon economy is a clear opportunity for our economy, for jobs and growth here in Europe. To support, we need an enabling framework to a real long-term transition to a low carbon economy, in particular by delivering on the Energy Union."

As vice-president for the European Energy Union, Maroš Šefčovič has reaffirmed the European Commission's commitment to a shift in focus towards low carbon energy. In May, at the opening of Energy Fest in



In Denmark, offshore wind farms are providing surplus energy

Vice-president of the Energy Union Maroš Šefčovič has said that renewables have environmental and economic benefits

Amsterdam, the Netherlands, Šefčovič listed his priorities for reducing the harmful effects of energy consumption on the environment, which he referred to as a six 'D' model: "Decarbonisation of our economy... to make sure low carbon innovation will help achieve our ambitious goals; diversification of our sources to ensure energy security and improving our trading conditions; democratisation of our energy system by empowering consumers; ... the decentralisation of our energy generation from large-scale energy generation to small interconnected generation; ... digitisation of our energy and transport system; ... and disruption of our business models along with new job profiles and skills." According to the vice-president, a focus on these six priorities will create the smoothest possible transition to renewable energy, reducing reliance on carbon-based fuels and harnessing natural resources to reduce greenhouse gas emissions and slow global warming.

In a speech delivered at Hannover Messe, Šefčovič said that as well as benefits for the climate, a shift towards low carbon energy could lead to greater economic prosperity: "The commission estimates the EU workforce in the low carbon energy industry at around nine million people. ... We expect this number to



double by 2030, so this transition to a low carbon economy can represent a goldmine for jobs and growth.”

Šefčovič went on to outline three major factors which have led to Europe’s success in this area over the past 25 years, and which will contribute to the continued growth of the low carbon economy sector: “First, we have managed to show the way by decoupling growth from emissions: our economy grew by 46% since 1990, while we reduced our greenhouse gas emissions by 24%. ... Second, Europe is already a world leader in many advanced technologies. ... Third, the EU is recognised as a global leader in fighting climate change. Paris was an historic success for the global community but also the European Union, which showed unity and global leadership.”

The vice-president argued that efforts should be focused on innovation and new technological capabilities, many of which are being developed and employed in Europe already: “We need to build on our strong position in renewable energy (wind, photovoltaic inverters, concentrated solar power and ocean energy), nuclear, smart grids, buildings and cities.”

Some European countries have demonstrated their commitment to low carbon energy by switching a majority of their energy services to renewable sources. For example, Denmark has steadily increased the percentage of its energy that derives from wind over the past three years, from 33% in 2013 to 42.1% in 2015, demonstrating a global lead. The Danish government has adopted a plan to increase the share of energy it receives from wind power to 50% by 2020, and to 84% by 2035, meaning that the country is heading efforts to decarbonise energy.

Similarly, Germany’s renewable energy sector has shown enormous growth over the past 15 years, with generation from sustainable sources rising from 6.3% in 2000 to around 30% in 2014. An additional 14% is derived from nuclear power, which further avoids CO₂ emissions.

In delivering this type of change across Europe, Commissioner Cañete said that a greater



On 12 May 2016, Germany’s renewables output equated to 99.3% of the demand at that time

amount of private investment needs to be offered, which will be triggered by EU funds, but that he is optimistic about the current state of renewable energy on the continent: “With the scope of needed investments, it is clear that shifting and scaling up private investment is essential. EU funds, such as the European Fund for Strategic Investments, will play an important role in mobilising the markets. Indeed the EU as a whole is well-placed to exploit these new opportunities. I believe that with our strong track record and continued focus on innovation, Europe is on the right track.”

In outlining goals for the future, Šefčovič outlined the specific advances that he wishes to tackle in order to ensure that progress in the transition to renewable energy responds to current and future trends in energy systems. For example, the vice-president stressed at Hannover Messe that the electrification of transport, the increased digitalisation of energy systems and the active role of consumers in energy need to be taken into account when innovating and planning future developments.

This push towards sustainable energy should come not only from the EU but from member states, Šefčovič said. Speaking in April ahead of the historic Brexit vote which has cast uncertainty over the UK’s future in the EU, he said: “We also want all 28 member states to adopt national energy and climate plans. The energy transition needs forward planning, consistency and predictability. Companies, investors and citizens need to know where the priorities are. No-one will invest in or buy new technologies if every few years, the orientation and policies change.”

Evidently, the transfer of reliance onto renewable energy remains a priority for the commission, with wind power in particular serving as a valuable indicator of the potential of sustainable energy sources to offer an alternative to fossil fuels. With Denmark now producing surplus power thanks to its wind farms, and Germany having provided almost all of its energy needs through renewable sources alone on one day in May, it is clear that renewables are a viable and necessary step towards the future of energy.

Evolution of small wind

Be-Wind's urban and distributed wind technology is a breakthrough in small wind technology. Berdan-Tech LLC discusses why

Be-Wind has developed a patented breakthrough in vertical axis wind turbine (VAWT) design. The evolution of wind (EOW) system provides low cost, efficient energy production, with artistic elegance, ease of installation, low maintenance, very low noise emission, upgradability and superb structural strength for extreme weather conditions.

Having developed the world's first dual axis wind turbine to enter the distributed small wind technology market, our system is generations above anyone in this field.

The EOW systems enter into the market at models producing under 10kW. This means it is perfectly configured for the urban and distributed energy market share. There are three systems currently in production, all of which are focused on the same technology foundation: dual axis with deflector technology, august rotor design and controlled blade gapping.

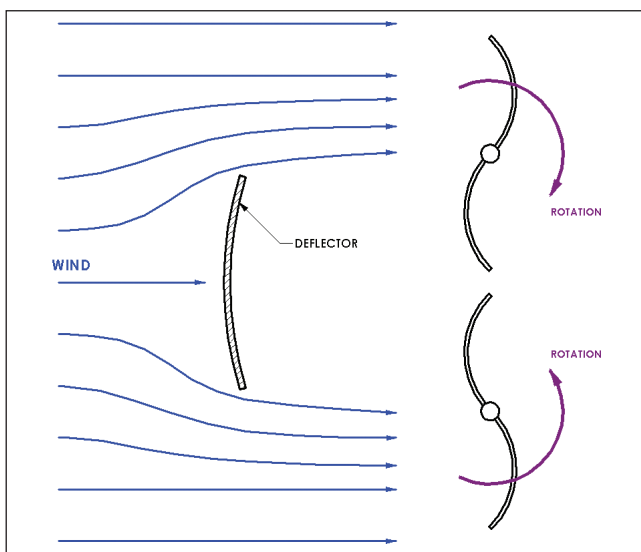
This revolutionary new design stems from years of technology development in aerospace and manufacturing, along with expertise in the wind technology market.

This technology offers design, structure, performance and flexibility, and has driven some of the major corporations to accept us as part of their green initiatives. L'Oréal cosmetics, for



Eow-300 5.0 kW system standing 10ft tall at 450lbs configured for larger homes, businesses and small wind farm applications. Also developed around our technology of low wind speed start-up and self-regulated high wind speed control

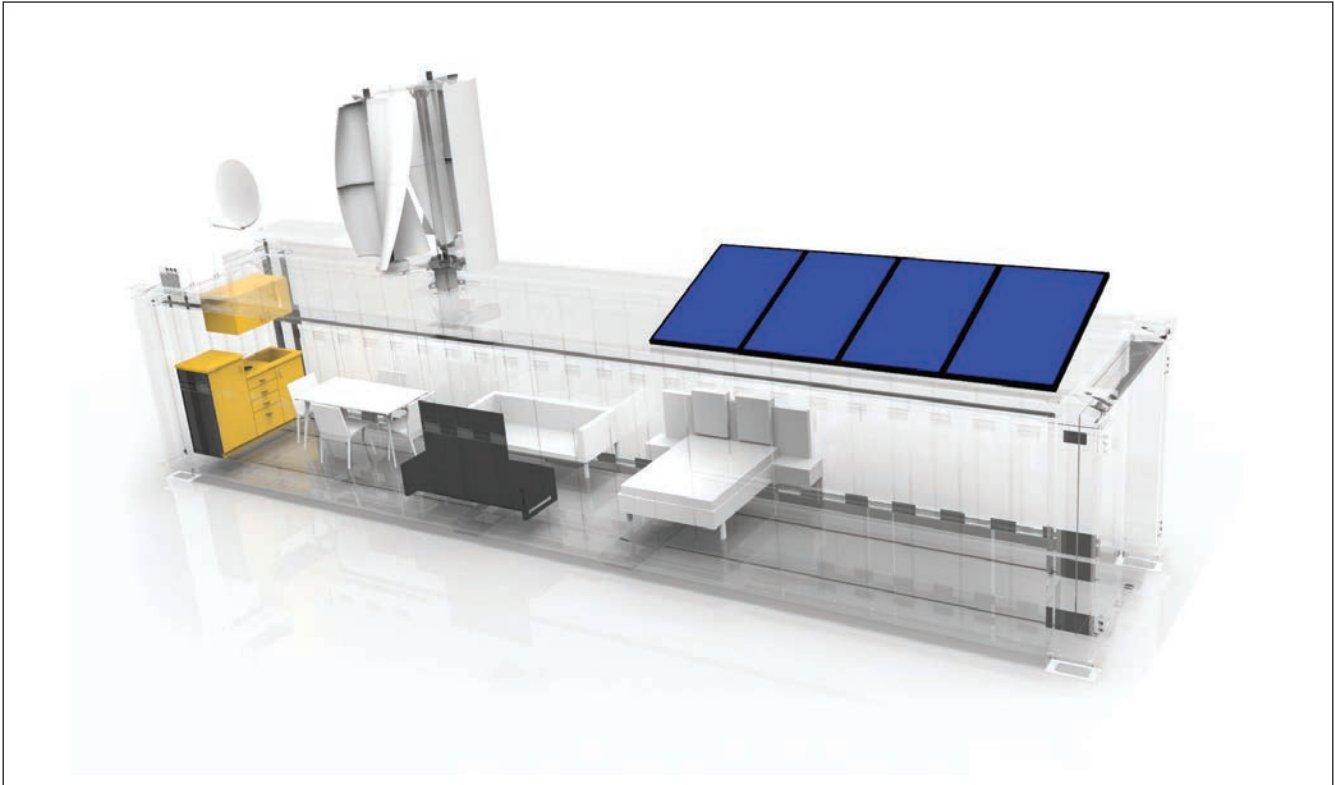
example, has selected Be-Wind and its products as their first choice in renewable wind technology in 2016. Several other major players have added us to their portfolio for their upcoming initiative projects as well, including educational facilities and a number of major universities. The Caribbean has accepted us as a major player to support the development of renewables. With continuing development and added accessories, the Be-Wind product clearly stands out in a crowd.



EOW-100 2.0 kW system standing 6ft tall and weighing 325lbs. Configured for remote high wind locations, such as telecom, remote mountain, ocean oil rigs, portable container systems, and extreme situation power requirements. With both grid tie and storage capacity applications



EOW-200 3.0 kW system standing 8ft tall at 375lbs. Configured for local/city environments, small business and remote housing locations. Our flagship product and most popular system to date. Developed around the same technology of low wind speed locations and extreme wind conditions. Averaging 6,000-9,000kW annually



The market

Be-Wind is entering the small wind market (<10kW) at the right time. Small wind is building momentum both domestically and on a global scale as part of a diverse community of distributed renewable energy platforms. Rising energy costs, climate change, government incentive programmes (federal, state and local) along with utility company feed-in-tariffs are driving the adaptation of small wind, and robust industry associations (WWEA, AWEA, CanWEA) have formed, bringing stability and credibility to the testing and certification process.

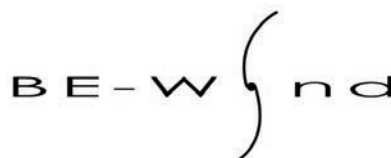
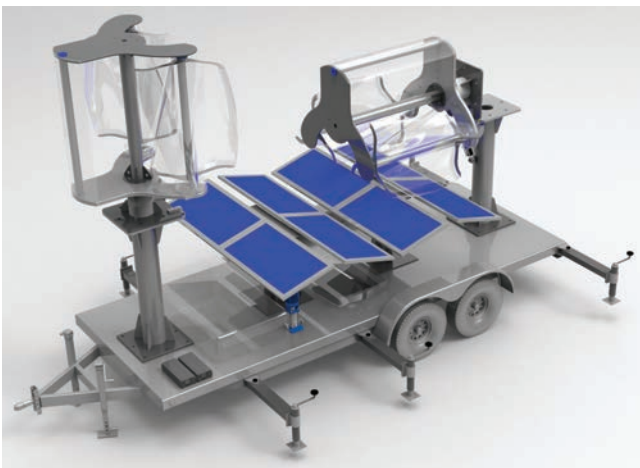
Application

Whether on or offgrid, customers value VAWTs because they operate in low shifting winds (e.g. urban settings, close proximity to ground <8mph), are both quiet and efficient, protect wildlife and are simply more attractive in their design. Borrowing from

Nature and applying aerospace technology and materials, the EOW family takes costs to a more affordable level of approximately \$4,000 (~€3,627) per kW, which is 20-30% less than our competitors, yet maintains a 25-30% higher efficiency in energy production.

Technology overview and competitive advantage

The EOW ‘Made in America’ turbine is a patented dual axis vertical turbine with a unique structural foundation, offering a number of features such as: expandability within the structure, lightweight aerospace materials, corrosion-resistant anodised aluminium, built-in blade RPM restrictions and auto-rotating structures for wind direction performance, dual generators for redundancy power, simple assembly and installation, colour co-ordination for special locations and/or environmental impact, and portability design for disaster recovery and first responder applications. The products are designed in 3D with stress analysis, computational fluid dynamics, real world testing and CNC machined for accurate assembly and performance.



Michael Berdan
Berdan-Tech LLC

+1 214 649 4862

mberdan@be-wind.com
<http://www.be-wind.com/>



PEN highlights the ways in which climate models can provide a framework for environmental research and global warming

Climate frame

Climate modelling uses trends in statistical data to create predictions about overall changes to the Earth's climate in the short or long term. Once the models have been created, they are tested against historical data to determine how accurately they are able to predict events in circumstances to which the outcomes are already known. Therefore, there is a keen need for large amounts of statistical data in climate modelling to ensure that predictions remain as precise and exact as possible.

Climate modelling offers an important framework for research into the environment and particularly for efforts to track and prevent global warming, but the large amounts of data and testing necessary provide challenges which must be overcome. A number of actions have been taken to attempt to address these problems and improve the ability of science to predict long-term climate trends.

An infrastructure innovation

Climateprediction.net is a large-scale organisation which asks volunteers to contribute the processing power of their home computers to climate modelling projects. The model simulates large-scale climate changes over the next 100 years, predicts temperature changes and rainfall, and calculates the probability of extreme weather events. By using the computer power of volunteers, the project capitalises on additional infrastructure that would be otherwise unavailable to a research team, and allows the study to be undertaken on a much larger scale.

Currently, the organisation has several projects which look to predict and map elements of climate change across the next century. One such

The HYDRA project studies changes in rainfall and the water cycle, which can be used to monitor broader environmental trends

project is HYDRA, which is tasked with monitoring the sensitivity of rainfall, evaporation and river runoff to changes in land use and the carbon cycle over the last 50 years, and using this data to predict changes that will occur in the future. With sea levels rising as a result of global warming, this type of project can be extremely useful in planning for potential alterations to the water cycle as the Earth's climate continues to change.

Another project is assessing the viability of geoengineering, which involves attempts to manipulate climate change on a large scale by introducing measures to counteract anthropogenic CO₂ emissions. One of the more feasible proposals in this sphere is the injection of sulphates or other fine aerosols into the stratosphere, improving the ability of the planet to reflect back some of the Sun's heat, thereby reducing the Earth's temperature. The team employs a number of modelling studies to predict what results such a technique might yield and compare this counter-anthropogenic geoengineering scheme with other plausible propositions.

The need for masses of data to provide the highest possible accuracy in predictions is evident, and the Climateprediction.net project's use of home computers' processing power demonstrates the need for large amounts of infrastructure to support such research.

Data collation

In terms of gathering data, the European Space Agency has a number of projects which are tasked with providing the most accurate and comprehensive data possible to ensure that climate prediction models remain accurate and respond to new and unexpected developments – for example the Proba-V mission, which provides multispectral images to monitor the evolution of vegetation on a daily basis, extending the dataset of previous missions launched in 1998 and 2002. Another is the



Cryosat mission, which measures ice thickness across Greenland, Antarctica and other inaccessible areas, revealing changes as the ice responds to climate change.

Further data has been gathered since 2009 by the Greenhouse Gases Observing Satellite (GOSAT), a project of the Japanese Aerospace Exploration Agency (JAXA) which specifically monitors the concentrations of greenhouse gases in the Earth's atmosphere. This data is shared with NASA and other relevant bodies and used for many important projects researching climate change.

The satellite has observed fluctuations in CO₂ emissions since its launch, calculating a monthly mean and reporting this information to JAXA and NASA, among other organisations. It has recorded that the mean CO₂ concentration in the Earth's atmosphere has risen from 385 parts per million (ppm) to almost 400ppm, and provides more specific figures for monthly values. This data is highly accurate and can be used to test climate prediction models with a considerable degree of precision.

Information applications

The predictions gathered from climate models have innumerable real-world applications. In June, the European Commission presented a proposal for the ratification of the Paris Climate Agreement, initially adopted in December 2015 and officially signed by the EU in April 2016. The target of the agreement is to limit global warming by 2°C above 1990 levels. The EU's commissioner for climate action, Miguel Arias Cañete, spoke of the importance of quick planning and ratification of the deal in order to effectively meet targets and avoid further damage that could be caused by climate change: "We are determined to maintain the momentum and spirit of Paris and ensure the early ratification – and the swift implementation – of this historic agreement. [The] proposal demonstrates our continued commitment to lead the global clean energy transition and build a modern, sustainable and more climate-friendly economy. I am confident that the European Parliament, Council and member states will complete the respective ratification procedures promptly."

In a speech at the UN signature ceremony for the Paris Climate Agreement, Cañete outlined the EU's initial plans for limiting climate change:



© Collection of Dr Pablo Clemente-Colon, Chief Scientist National Ice Center

ESA has launched a satellite to monitor the movement of ice, data which is incorporated into climate prediction models

"We have set ourselves a tough target of cutting emissions by at least 40% by 2030. It's why we're now updating all the legislation needed to deliver it: from renewable energy to electricity markets to energy efficiency and more. It's also why we will produce a solid mid-century low greenhouse gas emissions strategy by 2020. And as well as acting at home, Europe will continue to work with others abroad."

Progress has already been made, thanks in part to large-scale investments provided by the EU into climate research. Cañete continued: "I am proud that Europe is the biggest provider of climate finance worldwide. We do this as both an investment and a necessity. It helps our partners develop, improves the quality of life, builds resilience, and protects our shared climate system."

That same month, at the Global Green Growth Forum Summit in Copenhagen, Denmark, commissioner for environment Karmenu Vella expanded on the financial commitments that the commission has allocated towards fighting climate change: "One of the biggest challenges will be financing the transition to low carbon economies. In addition to the action we are taking at home, we are also scaling up support for climate-resilient development abroad. Europe already accounts for almost 90% of the climate finance announcements made in the run-up to the Paris Climate Agreement. They total €17bn. These are substantial financial commitments, but our commitments are not just about funding . . . Europe, like everywhere else, needs a more sustainable socioeconomic model."

Undoubtedly, climate prediction has a large role to play in dictating how such efforts must be managed. All climate models naturally take into account CO₂ levels, as the gas has been linked to large-scale climate shifts throughout history, and so this allows more accurate predictions to be made as to the effects that emissions have on global temperature. These can be used to estimate and quantify how big of a reduction is necessary to limit global warming, per the Paris Climate Agreement, and inform both scientific research and policy recommendations.

BINGO – climate change and water cycle impacts

BINGO is a 48-month Horizon 2020 Climate Action Research and Innovation project launched in July 2015

Decision makers in many key sectors often express frustration about the limited practical use of climate change scenarios. Current models can be too coarse and not sufficiently detailed, in space and time, to effectively support water management decisions. Research on the climatic impact on water and appropriate adaptation strategies is also often performed without an understanding of the applied needs of decision makers, thus limiting research usefulness and adoption. Appropriate climate services are needed in terms of improved climate scenario downscaling, as well as anticipation of climate impacts on the water cycle for the near future. Risk management strategies are also required, in particular for highly vulnerable water resources of strategic importance.

BINGO (Bringing INnovation to onGOing water management – a better future under climate change) aims at providing adaptation strategies for climate change-related challenges, through co-produced tools and methodologies for water and land resources management strategies that are based on an improved understanding of future climate and its impact on the hydrological cycle. BINGO will address average and extreme conditions of climate change scenarios, focusing on integrated demand-driven solutions for six representative research sites across Europe.

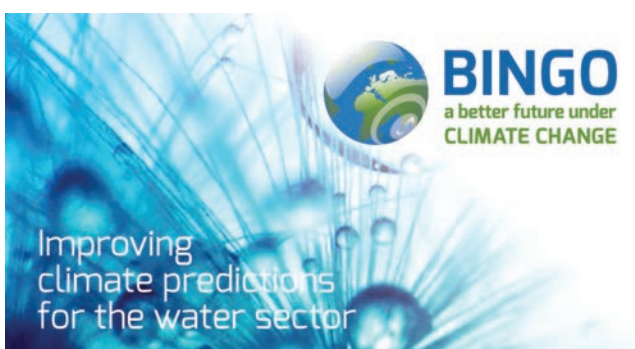
Led by the National Laboratory of Civil Engineering (LNEC), Portugal, BINGO has a budget of €8m and the consortium includes 20 European partners located in six countries. While global climate projections give information about long-term climate change, and weather forecasts inform only a few days or weeks ahead, decision makers and other end users also need guidance on inter-annual to decadal timescales. As a hands-on response, BINGO aims at both reducing the uncertainty of near-term climate predictions and developing response strategies that may help society to better manage the remaining uncertainty.

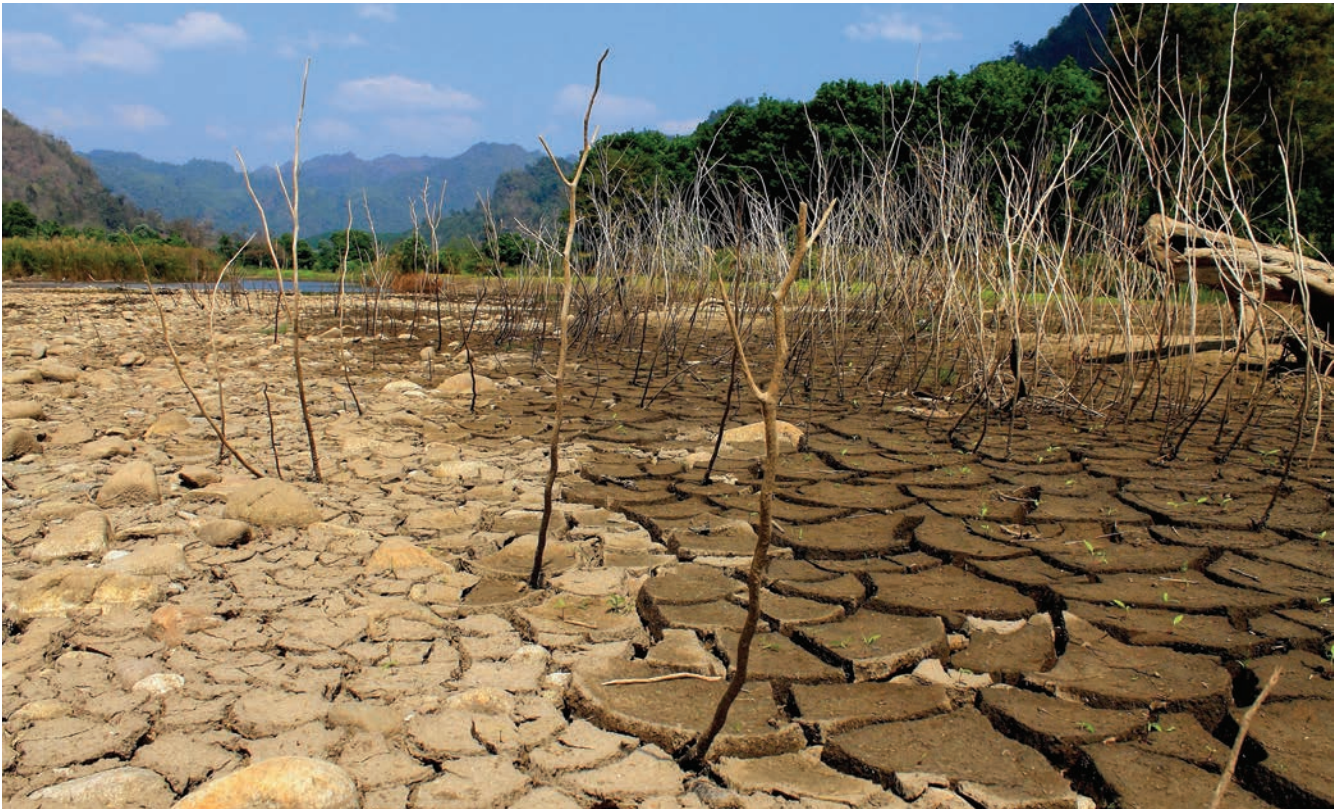
The project's results will be demonstrated in Cyprus, Germany, the Netherlands, Norway, Portugal and Spain – covering a wide and representative range of climatic conditions, water use combinations and pressure typologies. They also represent conflicts involving water use by different economic activity sectors – urban tourism, agriculture, food safety and hydroelectricity. The scenarios thus provide the strong potential for replication of the solutions developed in other regions, in and out of Europe, and particularly for the Mediterranean Basin. In order to ensure robust and achievable strategies for water resources management, BINGO is committed to developing and validating the adaptation strategies and solutions in a dynamic co-operation between researchers and end users. By fostering these knowledge alliances between different actors and by creating a community of practice (CoP), BINGO will address both the real concerns and the near-future scenarios, involving water resource managers and others interested in the awareness of climate challenges and the co-production of solutions. Strong end user involvement from the very beginning allows BINGO to boost understanding of climate change, innovation capacity and the integration of new knowledge.

How BINGO works

Starting one year ago, BINGO has already achieved downscaled climate data for present and past conditions provided as decadal predictions (2015-2024). The potential usability of the different climate model outputs has been maximised for each of the six research sites, by bias correction and downscaling using ensemble techniques, as well as properly evaluated by suitable forecast verification approaches. Simulations have also been completed. The decadal projections have also been dynamically downscaled to the same horizontal resolution. Work to identify extreme patterns for each research site is ongoing. These ten-year scenarios will be made available in a spatial resolution adapted to the specific problems, thereby empowering decision makers and managers to act at various geographic levels. A web-based and on-demand extraction and conversion tool has been set up, allowing the hydrological modelling groups to search and extract the data and then convert it to their needs. This tool is already available for anyone upon request on the BINGO website.

An integrated analysis of the water cycle for all six BINGO research sites, based on several hydrological, hydrodynamics and water quality models, in accordance with the specific conditions of each site will now be implemented. Hydrological droughts and floods will be carefully evaluated in the context of climate change. The analysis will be provided as part of the baseline situation and for future scenarios that combine climate change with land use





change; the modelling work will thus be able to consider a range of different situations for the water cycle. Results will also be used to complete the risk management process. A framework for managing risks is proposed – providing a route from the development of the climate scenarios to climate change adaptation strategies, and aiming to help sustain key economic sectors and the environment, as well as protecting people and property.

The development of specific risk treatment and a portfolio of adaptation strategies for each of the six research sites will be provided under BINGO, as well as an analysis of the economic and societal implications of the climate change-induced impacts and of the proposed measures. Ensuring the effective participation of all the different end users, water managers and decision makers in BINGO activities is a key issue. The project offers a set of tools designed to ensure that researchers and end users/decision makers will co-operate, building shared awareness and knowledge, leading to high level research designed to provide answers to society needs.

Local initial workshops with stakeholders were successfully implemented at the six research sites in February-March 2016. The BINGO CoP has also been created and is progressing well. Aimed at ‘setting the scene’, the workshops promoted dynamic interactions and discussions on climate risks. Further workshops will be organised throughout the project. Participation in the CoP is welcomed for all those interested in the theme. Requests to be involved can be made through the BINGO website. To date BINGO has managed to reach out to thousands of different types of stakeholders, including policy makers, the scientific community and the broader public, through various dissemination activities. Ultimately, the spirit of BINGO is to develop a new and global

approach to dealing with climate action and management of the integrated water cycle, incorporating its several dimensions, thus setting up a scalable model to be followed by others in Europe and all over the world.

BINGO is composed of eight research and innovation partners, LNEC, KWR, IWW, Aqualogy, NTNU, InterSus, FuB and CYI, and stakeholders from different decision levels, including seven policy bodies, CIMLT, DGADR, AMB, Ajunt.Badalona, Prov. GLD, Bergen Kommune and Wupperverband, two water utility companies, EPAL and AGBAR, and three SMEs with sectorial focus, SPI, I.A.CO, and Vitens. BINGO also benefits from a project advisory Board – a high-level international panel of experts from different areas of knowledge chaired by Paul Fleming from Seattle Water Utilities, USA.



Rafaela Matos
Principal Researcher
BINGO Project Co-ordinator
National Laboratory of Civil Engineering (LNEC)

+351 21 844 3420

rmatos@lneq.pt
tweet @EU_Bingo
www.projectbingo.eu
www.lneq.pt

The EUROPARC Federation’s executive director, Carol Ritchie, explains to PEN how the not-for-profit is working to give a voice to protected areas in Europe

A conservation conversation

Nature conservation has long been a hot topic of conversation, but the recent Paris Climate Agreement and launch of the Sustainable Development Goals have inspired a new sense of urgency when it comes to preserving our environment. Land use change has led to the fragmentation and degradation of countless natural and semi-natural habitats, over-exploitation is depleting our natural resources, and pollution continues to threaten Europe’s biodiversity and ecosystems. Never has it been more important for society to address its environmental footprint and take real steps to protect Europe’s rich and varied biodiversity.

With this in mind, Pan European Networks spoke to Carol Ritchie, executive director of the EUROPARC Federation, to learn more about the importance of protected areas in Nature conservation. Here, she discusses the role of EUROPARC as the voice of Europe’s protected areas, how it is working with the commission to inform and enhance environmental legislation, and why people ought to reconnect with the land.

What role does the EUROPARC Federation play in conservation activities, and in what ways does it involve Europe’s citizens in these events?

The EUROPARC Federation is the representative body of Europe’s protected areas. Our vision is one of sustainable Nature: valued by people. As the collective voice for all Nature and landscape areas, we seek to build a stronger, unifying European network organisation that is better placed to support our members and to respond to the current and future challenges facing Europe’s Nature – among them the need for greater ecological coherence, increased protection of biodiversity, and improved

sustainability of our natural and cultural heritage and its resources.

EUROPARC provides a forum to share professional experience, collaborate on technical projects and progress common aims in order to support the management of Europe’s protected areas. It is our members themselves who do the specific conservation activities in the protected areas, although we of course encourage people to get involved in the work of their local protected areas, including via the conservation activities which they host.

We also support sustainable tourism through our European Charter for Sustainable Tourism in Protected Areas, which has over 150 areas certified as sustainable destinations. In this field, we especially encourage our members to engage with tourism businesses in the conservation activities going on in the protected areas that their clients visit.

Further, we have very successful Junior Ranger and Youth+ programmes, again which operate across Europe, helping parks provide opportunities for young people to get involved in the conservation of the area.

Scotland has recently been the recipient of much conservational attention and funding – not least with the Rewilding Project, Trees for Life and the Scottish Wildcat Haven. Can you tell us what this means for Scotland and what similar projects can mean for other areas of Europe?

While I am not familiar with these projects, anything that inspires and engages people, that helps them realise the value of the landscape that we are all a part of, has to be a good thing. People are a part of, not apart from, the land, and that reconnection is needed across society. I have concerns about the segregation of Nature and conservation from the rest of society, so projects that concentrate on Nature,



Biebrza National Park, Poland, a wetland site of worldwide significance

© Ministry of Foreign Affairs of the Republic of Poland

wildlife and conservation of the landscape and culture, and that put people into that picture, living and working sustainably with the land, need to be mainstream in Europe.

In what ways does the EUROPARC Federation interact with the European Commission regarding environmental policies?

As the largest protected area network, EUROPARC has a responsibility to be the voice of protected areas, especially at a European level. The work of protected areas across Europe makes a valuable contribution across several EU policy areas, notably on Nature and biodiversity through the management of much of the Natura 2000 network, as well as through sustainable and rural development.

EUROPARC has established good co-operation with the European Commission, including with DG Environment for all areas that directly concern Nature and biodiversity conservation (including Natura 2000, green infrastructures, the LIFE programme, large carnivores, ecosystem services, invasive species and wilderness) as well as DG Enterprise for the areas that concern sustainable tourism. We are also working to establish closer connections with DG Agriculture, DG Regional Policy and DG Climate and Fisheries, and already work in close co-operation with the European Parliament and the Committee of the Regions, having regular contact with MEPs, delegates and the EP Intergroup on ‘Climate Change, Biodiversity and Sustainable Development’.

Through its Brussels office, EUROPARC ensures direct connection with other European institutions, including the commission and the



Cairngorms, Scotland, is home to a quarter of the UK’s rare and endangered species

Council of Europe. We represent members’ interests at European level and actively contribute to the development of EU relevant policies, providing expertise, facilitating the exchange of experiences and driving the flow of information from and to our members.

Regular meetings with regional authorities and other institutions, together with the representation of our members in various meetings, seminars and international conferences, are also part of our daily work in Brussels. In particular, EUROPARC works closely with the European Habitats Forum, is represented on the commission’s Natura 2000 Expert Working Group and the EU Platform on Coexistence between People and Large Carnivores.

So, yes – we do a lot of work with the commission.

As a result of the COP21 agreement reached in Paris in December, what does the future hold for both the EUROPARC Federation as a body and for the protected green areas of Europe?

All ecosystems store approximately 50% of all the carbon emissions, and protected areas in particular store 15% – for free. Therefore, EUROPARC, which was present at COP21, believes protected areas play a vital role in climate change mitigation and adaption. We believe that giving space to Nature is to give ‘breathing space’ to ourselves and future generations.

EUROPARC will keep on working side-by-side with protected areas, raising their voice at a European level and together creating solutions for climate change mitigation within protected areas.

The Oostvaardersplassen, a Nature reserve and Natura 2000 site in the Netherlands



Carol Ritchie
Executive Director
EUROPARC Federation

<http://www.europarc.org/>



BirdLife Europe’s senior head of policy, Ariel Brunner, tells PEN why better implementation of the Birds and Habitats Directives, increased funding and greater innovation are vital to Nature conservation efforts

Stand up for Nature

The loggerhead sea turtle, the bittern, the Iberian lynx, the brown bear, the white-tailed eagle – these are just a handful of the iconic species which are in recovery thanks to the Birds and Habitats Directives, the cornerstone of legislation to protect Europe’s wildlife and the laws responsible for Natura 2000, an ecological network of protected areas throughout the EU which safeguards almost one-fifth (1,000,000km²) of EU land and around 4% (250,000km²) of marine sites – altogether providing special protection for some 27,000 places and 1,000 species.

But this legislation, and the Nature it protects, is at risk. In 2015, the European Commission began an evaluation or ‘fitness check’ of the Birds and Habitats Directives, the results of which were intended to form the basis of discussions at a high level conference on ‘future-proof Nature policy’ in Amsterdam, the Netherlands, at the end of June – a conference which the Dutch Presidency cancelled just 20 days before it was due to be held, given that the commission had still not published its findings. The delay has inspired greater concerns about a decision to revise the directives, which could have a dramatic impact on the future conservation status of some of Europe’s most beloved plants, animals and places.

BirdLife Europe believes that better implementation of the directives, rather than revision, is the best outcome for Nature in Europe. To this end, it teamed up with the European Environmental Bureau, Friends of the Earth Europe, WWF and other NGOs to launch #NatureAlert, a call to action which has mobilised citizens and served to remind them not only that Nature in

Loggerheads are the most common turtle in the Mediterranean, but they are under threat from tourism, fishing and pollution



Europe is still under threat, but also that the EU has the tools to do something about it.

The response has been staggering. A record-breaking 520,325 citizens took part in the public consultation on the EU’s fitness check of the Birds and Habitats Directives last year; more than 94% of them asked the commission to maintain and enforce the legislation. Then, in December, environment ministers added their voice to those calling for the laws to be safeguarded, and in February, MEPs voted by an overwhelming majority of 592 to 52 to approve a report on the mid-term review of the EU’s biodiversity strategy, which recognises the importance of the Birds and Habitats Directives and demands their protection.

Nevertheless – and despite the wealth of evidence demonstrating the effectiveness of the legislation when properly enforced and implemented – BirdLife Europe is concerned that political interests may sway the decision and throw Nature conservation efforts into years of legal uncertainty.

Here, BirdLife Europe’s senior head of policy, Ariel Brunner, sets out what’s at risk if the Nature directives are revised, why the EU needs to do more to protect Europe’s biodiversity, and why it’s the Common Agricultural Policy that really needs a fitness check.

BirdLife Europe is in steadfast opposition to a revision of the Birds and Habitats Directives. How instead would you like to see biodiversity loss better tackled?

Action needs to happen on the ground in the member states and in many cases at the regional and local levels. But if we want to solve a global issue such as biodiversity loss, we need action at a higher level, and the EU is very well-placed to deliver that action.

For example, we have a systematic failure of enforcement. In many parts of Europe people

are getting away with, for instance, the illegal destruction of natural habitats and protected sites, and that needs to stop. In order for that to stop, the commission needs to exercise, in a much more efficient way, its role as guardian of the treaty – that’s the first thing. Second, we need new tools and much more effective inspection regimes. Some countries have very effective environmental inspectorates which can actually control what happens on the land, but others don’t. There is a clear gap for new EU legislation setting standards for environmental inspection so that everywhere in Europe has competent inspectors with the right resources, the right mandate and the right powers to actually enforce environmental legislation, including the Nature directives.

In line with that, we also need to give DG Environment some direct inspection capacities. In the air safety domain, for instance, the EU has its own inspectors so that it can, in a sense, double check whether member states are doing their job, and as a result we have very safe skies. In the environment domain and for biodiversity in particular, we still have a situation where when a member state decides to turn a blind eye it becomes a magnet for illegal activities and you get pressure on others to also turn a blind eye. The results of that speak for themselves.

On top of that, there are huge issues with environmental crime. The environmental crime directive is very poorly enforced, which means that in many cases criminals, assuming they are caught in the first place, are getting away with minimal sanctions that are not at all dissuasive.

Meanwhile, we are too heavily dependent on the commission acting as the guardian of member states’ obligations because in most EU countries citizens and NGOs do not have proper access to justice. This means that if authorities are corrupt or negligent you cannot go to the court or get justice; the only thing you can turn to is the already not very efficient EU infringement machinery. Legislation is therefore needed to modernise and standardise access to justice across the EU. This is an obligation under the Aarhus Convention which has been signed by all the EU member states and the EU itself, but is blatantly not respected in much of Europe.

Finally, there are also some issues around implementation, i.e. the way the rules are handled. We see a lot of best practice but also a lot of very messy implementation. In this



The largest UK bird of prey, the white-tailed eagle went extinct in the country during the early 20th Century but has since been reintroduced

sense, there is a space for guidance from the commission and also for creating new platforms to allow member states to talk to each other and to stakeholders, businesses and NGOs in order to ensure that the things that work are exported to the rest of Europe, e.g. management of Natura 2000 sites, species protection plans, etc. In some places you end up with horrible bureaucratic entanglements – businesses complaining that they are being paralysed, NGOs complaining that Nature conservation is not working – when often, just across the border in another member state or another region, there is a very efficient system in place which is enabling very good conservation, low levels of bureaucracy, and happy entrepreneurs. There’s huge scope for bringing people together, seeing what works, and then seeing if what works in one place will work in another.

The mid-term review of the biodiversity strategy to 2020 highlighted insufficient financing as a key reason why the EU failed to meet its 2010 biodiversity target – how would you assess the funding landscape now? Is there more available, and is it being directed to the right areas?

There is a huge question around funding. One of the EU’s most obvious failures is that the promise to deliver funding for biodiversity conservation in general, and for the management of Natura 2000 in particular, has not been realised (under the previous budget, only 10-20% of the funding for managing the network was available, and there are no indications of a major change in the current budget period). This isn’t the case across the board – you could argue that some funding streams in development aid, potentially in research, are doing better – but in the case of agriculture, for example, there is a terrible failure to invest in biodiversity-friendly farming. Meanwhile, the LIFE programme, which delivers excellent results and receives frequent praise from the Court of Auditors, remains a tiny fund and is only 0.3% of the EU budget.

On the whole, the funding that is being delivered is a fraction of what is needed, and that’s despite the fact that there is a lot of evidence that investing in biodiversity and ecosystems gives a huge return on investment – in terms of money, societal benefits and job creation. We have every reason to invest more in Nature, but we are still failing to do

so. It's time now to look at the issue strategically, see where the blockages are, and come up with a solution.

How would you like to see complementary measures such as the Common Agricultural Policy improved so as to better support the Nature directives?

There are very clear problems with the implementation of complementary policies. One of the things to have come out of the fitness check process is that biodiversity legislation *per se* is good and when implemented is doing its job, but its impact is in many cases being swamped by the negative impact of other policies – the most problematic of them being agriculture.

The CAP needs a fundamental rethink: the bulk of its funds are spent on subsidies for intensive agriculture – which stifles innovation and change because it preserves the usual way of doing things rather than helping people to do them in a better, more intelligent way – it fails to deliver for farmland biodiversity, and it has a harmful effect on Nature areas and threatened species far beyond farmland. We know what the problem is, and we partially know the solution, but the current policy framework is completely broken and not up to the task.

The Common Fisheries Policy has, historically, been one of the most destructive policies in terms of biodiversity. It's undergone major positive reform, but the job is only half done: new pieces of legislation on technical measures and data are still going through, the regional management plans are yet to be adopted, and there are still problems in terms of controls and penalties for illegal fishing. There's a lot of work to be done, but we are seeing a positive overall dynamic in terms of policy making.

Another sector worth mentioning is energy. We are hopefully in the midst of a radical energy transition away from fossil fuels and towards a low and eventually zero greenhouse gas emissions economy, but this presents a lot of challenges because many renewable energies have biodiversity issues, some of which are particularly problematic – bioenergy, for instance. Even the more benign infrastructures such as windfarms or solar panels can endanger species or harm habitats, if not properly located and planned. The thing is, there is plenty of room to expand renewables without harming biodiversity – even with very

The bittern was under threat of a 'second extinction' in the UK in 1997 but has been saved thanks to targeted conservation efforts and significant LIFE funding



stringent biodiversity safeguards. There is no reason why there should be conflict between the sectors, but there will be if we don't do things properly. The new 2030 Climate and Energy Package legislation is an opportunity to fix these problems and also to make sure that they don't arise in the first place.

Vytenis Andriukaitis, the European health commissioner, is advocating 'health in all policies' – is this an approach you'd like to see adopted with regard to Nature and biodiversity?

Absolutely. Biodiversity conservation cannot be seen as a 'sector', it needs to be part of every aspect of our economy and society. And it is very important not just to integrate biodiversity into other policies, but also to integrate all the different policies into one another. Take health, for example. Access to green spaces and protected areas has a huge impact in terms of physical and mental health, so integrating health and Nature policies is a win-win. The Natura 2000 network, aside from protecting biodiversity, can also improve the quality of life and the health of the people that live around and inside those sites, and most Europeans live within just a few kilometres of the closest Natura 2000 site.

Similarly, many of the biodiversity-related problems we face today are the same problems impacting on our health. Air pollution – which includes the emissions from intensive agriculture – kills tens if not hundreds of thousands of Europeans and also destroys biodiversity. Cleaner air would improve the conservation status of many species and habitats, as well as saving human lives and enhancing quality of life.

So-called 'lifestyle diseases' are another challenge, but many of these aren't actually about lifestyle at all, they're about bad food and bad feeding habits. If we produce better food and consume better food, we can recover biodiversity and improve health. Take meat as an example: meat consumption is the biggest contributor to our environmental footprint and we all know that we eat too much of it. There's a gap there for a different set of policies that can help people consume less meat, but of a better quality, which means less factory farming, less dependence on feed, fewer polluting emissions and more sustainable



© Lubos Houska

grazing, which can help manage natural grasslands and so on.

What role can research and development play in protecting biodiversity?

There is huge scope for innovation in Nature conservation. I think we are still suffering from a sort of 20th Century mindset whereby innovation is associated with ‘hard’ technologies, e.g. machinery, electronics and so on, and conservation is interpreted very literally, i.e. keeping things as they are. Both have a role to play, but there is huge potential in ecological innovation which is not getting the attention it should.

Classic ICT does have a role to play. For example, technology could help us to modernise the way we control the enforcement of legislation. In particular, remote sensing could revolutionise the way that we enforce land use planning and control the way that land use change is done, which could have an enormous impact because land use change is by far the biggest cause of biodiversity loss. There is a lot of illegal land use change all over Europe – not just in the less well-governed corners of the continent but also in those countries that you would expect to be frontrunners. To be honest, it is quite embarrassing that countries like Brazil now use real-time satellite technology to, for example, combat illegal deforestation, while in

BirdLife Europe is concerned that any decision to revise the directives could have a dramatic impact on the future conservation status of some of Europe’s most beloved plants, animals and places

Europe we are still pretending that we are unable to know whether the farmer is ploughing up the protected grassland to plant maize or whether a Natura 2000 site is becoming a golf course.

As well as remote sensing, we should also be empowering citizens to act as controllers of what is happening on the ground. Other domains are witnessing a growing use of apps that allow citizens to report problems directly from their mobile phones, which is definitely something that could be done in the environmental domain.

But we need a much broader innovation agenda. Ultimately, we need new ways of working together with Nature, new ways of creating economic value out of natural habitats and ecosystems, and new process innovations – new ways of doing the things we’ve always been doing: agriculture, flood protection and adaptation to climate change. We live in a rapidly changing world and are facing a huge ecological crisis. If we are to have a functioning society where people have access to food, housing and beautiful Nature, are safe from extreme weather events, and are able to go on living the kind of lifestyle they want to, then we will need to change a number of things. We’ll need to restore a lot of Nature and we’ll need to do a lot of the things we do today in completely different ways, and this requires a lot of innovation in all sorts of fields. That’s the appeal I want to send to the research community: help us reinvent all sectors in an ecologically minded and biodiversity-compatible way.

Ariel Brunner
Senior Head of Policy
BirdLife Europe

www.birdlife.org/europe-and-central-asia
<http://storify.com/NatureAlert/nature-alert>



As detailed here, the European Innovation Partnership on Water facilitates pan-European collaboration to accelerate the development of technology and governance innovation in the water sector

Boosting water innovation

Water is increasingly regarded as being the number one risk for the world economy. The pressure on 'resource no. 1' is increasing, and the next few years and decades require water-related technological and governance solutions, many of which will need to be truly innovative. 'Business as usual' and simply more efficient water management alone will not be able to address the various challenges ahead.

In contrast, investments into innovative solutions to help ensure water services maintain citizens' quality of life and satisfy competing water demands are not happening at sufficient speed. Therefore, we are failing to benefit from the great potential of innovations developed by researchers, non-profits, innovators, small and large companies, and others. In Europe, more innovative water solutions can only be developed and implemented if:

- 1) The continent brings key stakeholders together to collaborate and effectively address, and remove, the main governance and regulatory barriers to water innovation; and
- 2) Europe increases public finance schemes to help ensure water innovators get access to appropriate kinds of funding.

These are but two of the key challenges on which the European Innovation Partnership on Water (EIP Water), established under the



European Union's 'Innovation Union' initiative, concentrates its efforts. According to EIP Water there are at least five key areas in which innovators should not face unnecessary blockages and barriers:

- 1) Access to finance;
- 2) Regulatory obstacles;
- 3) Public procurement;
- 4) The need to fine tune public private partnerships; and
- 5) Provision of testing and demonstration sites.

In these areas EIP Water addresses, for example, challenges in obtaining permits for water innovation-related activities, as well as mismatches in the risk-reward balance for the financing of water innovation projects. In the area of finance for water innovation, EIP Water is promoting and supporting initiatives to give the water sector the prominence it deserves; secondly, it advocates for putting a priority on regional development programmes, such as in the design and implementation of EU countries' and regions' research and innovation strategies for smart specialisation called RIS3. A further focus is on municipality-oriented schemes, some of which are involved in one of the 29 EIP Water action groups – City Blueprints. The goal of this action group, with a broad variety of members in Europe and beyond, is to organise interventions at the local level to overcome barriers in the governance systems. Such barriers hinder development and the uptake of more innovative urban water governance solutions.

Led by the Directorate General for the Environment of the European Commission, EIP Water aims to collect and bring those challenges to the attention of European policy makers, and to ensure that they are fed into policy making processes. The 29 EIP Water action groups add value by offering practice-based input in the aforementioned processes.

For example, five EIP Water action groups dealing with water reuse in different areas have already provided highly valuable input to the EU Common Implementation Strategy Guidance paper on Integrating Water Reuse in Water Planning and Management.

EIP Water is a key facilitator for bringing diverse entities from across Europe together and by identifying, understanding and seeking to remove barriers to innovation. In terms of thematic priorities it focuses its work on:

- 1) Water reuse and recycling;
- 2) Water and energy;
- 3) Water and wastewater treatment, including recovery of resources;
- 4) Flood and drought risk management; and
- 5) Ecosystem services.

Furthermore, it has identified the three cross-cutting priorities of water governance, decision support systems and monitoring, and financing for innovation.



EIP Water is engaged in driving water innovation

Technology innovation and governance innovation are interdependent

To a great extent, many innovative water technologies already exist. However, to get the maximum benefit from them, there needs to be more practical testing, collaboration, co-ordination and exchange of best practices. Innovation in the water sector also needs to focus on the key challenges that Europe faces, such as proper management of water use and consumption in agriculture and other sectors like energy, and curbing diffuse water pollution, such as from fertiliser and other agrochemical use.

Implementing an effective strategy for water innovation that covers technology and governance, and offers a realistic business case, is crucial for maximum benefit from the trend of global value chains, to build and strengthen knowledge-based capital and rapid technological progress. In the current context of a weak global recovery, water sector stakeholders need to take advantage of these trends to accelerate structural shifts towards an innovation-based sustainable economic future.

Action groups – at the core of EIP Water

EIP Water has set up 29 action groups composed of members from all over Europe. They have a remit to co-ordinate stakeholders in different fields of water innovation and to facilitate the development of solutions that will address major European and global water challenges to overcome existing barriers. Many action groups work on technological or Nature-based demonstration sites, pilots and prototypes that will help take water innovation forward, while others are building specific platforms, such as on finance and water justice matters.

One action group is ARREAU, ‘Accelerating Resource Recovery from the Water Cycle’. It works on the production of useful raw materials, such as phosphorous, cellulose and iron, through waste and drinking water treatment. Technologies for the treatment of water and the recovery of such resources already exist, but these need to be demonstrated, and plans to take the technologies to market need to be drawn up.

Why and how to drive water innovation in Europe

For insights into the work of a large variety of experts and their appreciation of ‘what drives water innovation in Europe’, EIP Water has conducted a series of interviews with stakeholder representatives from the EU commission, governments, science, finance, the corporate sector, innovation experts and others.

The series, produced during the third EIP Water conference in February 2016 in Leeuwarden, the Netherlands, presents three minute interviews with speakers such as: Dutch minister Melanie Schultz van Haegen on challenges facing Dutch water and what she learnt outside of the Netherlands; innovation expert Mariana Mazzucato on patient finance for innovation; UNESCO-IHE’s Dr Uta Wehn on the specificity of innovation in the water sector; Reinhard Hübner on the difference between invention and innovation; Network H2O’s Richard Elelman on water as the biggest challenge of the 21st Century; and Diane d’Arras, executive VP of Suez, on the strengths of the European water sector, and what Europe might need to do better. All speakers are introduced via the 2016 EIP Water conference film ‘Let’s talk water innovation’ on <https://youtu.be/-yVjt7PYyWg>

Participants of the Leeuwarden conference have also produced the ‘Leeuwarden declaration: Why and how to drive water innovation in Europe’, which presents key findings and a European innovation action agenda addressing the need to accelerate the development and uptake of innovation: www.eip-water.eu/leeuwarden-declaration-why-and-how-drive-water-innovation-europe

ARREAU will support the construction of demonstration plants capable of removing cellulose from wastewater – for example from toilet paper, which comprises up to half of the total suspended solids and a considerable share of organic carbon in urban wastewater. Cellulose fibres can then be used as a filtering aid to improve the dewatering of wastewater sludge, or can potentially be used in other applications, such as the manufacture of bioplastics. Different projects have already looked at different aspects of the value chain that could emerge around recovered cellulose. Technology to separate cellulose from wastewater has been piloted at Groningen in the Netherlands, while technology to produce bioplastics from clean cellulose fibre has been tested at Beemster, also in the Netherlands. The aim is to turn cellulose from wastewater from being a low grade residue into a high value raw material with environmental benefits from optimised use of resources and the introduction of more efficient technologies.

In June 2016, ARREAU held a highly successful event with the ‘Struvite Recovery & Recycling Learning Alliance’ mainly targeting operators of wastewater treatment plants. The peer-to-peer learning event brought over 50 stakeholder representatives from science, technology experts, government and the private sector together to learn from each other and showcase how struvite recovery already works; the practical and legal aspects on the journey ‘from recovery to recycling’ were also presented.

The already mentioned City Blueprints Action Group has established a global network of urban water service providers as a community of practice which shares knowledge of and among municipalities and regions. Its methodology for assessing the sustainability of urban water services is very successful in translating technical assessment data into management information. The actions group’s unique selling proposition

is the successful aggregation of knowledge to a management level. In this regard, it complements and extends other initiatives in the field of benchmarking. The combination of a sophisticated technical methodology with a strong orientation towards governance and involvement of citizens is an essential element of the City Blueprints approach. Based on this common assessment methodology, the community of practice has a strong peer-to-peer learning component related to the assessment, rehabilitation and governance of urban water services.

The methodology has been tested in more than 50 cities and regions globally so far, with a centre of gravity in Europe. Currently, the analysis methodology is being extended to integrate waste management and other aspects in the frame of a smart city approach. City Blueprints plans to complement the analytical methodology with knowledge on planning and rehabilitation in order to improve the sustainability of urban water services. In the mid-term perspective, City Blueprints intends to continuously increase its knowledge base by integrating the assessment results of approximately 200 cities across Europe and beyond. The action group constantly looks for involvement of new municipalities and regions.

Where water innovation takes place – first ever global overview of more than 60 water innovation hubs

The water sector is large and complex, with many stakeholders operating in a large number of sectors. In this multifaceted environment, ‘water hubs’ play a role in creating efficiency advantages and maximising innovation uptake in society and the economy. The challenge, however, is to get an overview of the diverse initiatives and activities of water hubs in order to maximise the benefits from their respective activities. This complexity only increases with the paradigm shift from silo thinking and linear models towards an approach that embraces the circular economy and that aims for a grid approach, with deep connections to energy, raw material recovery, reuse, and the green economy and ecosystem services.

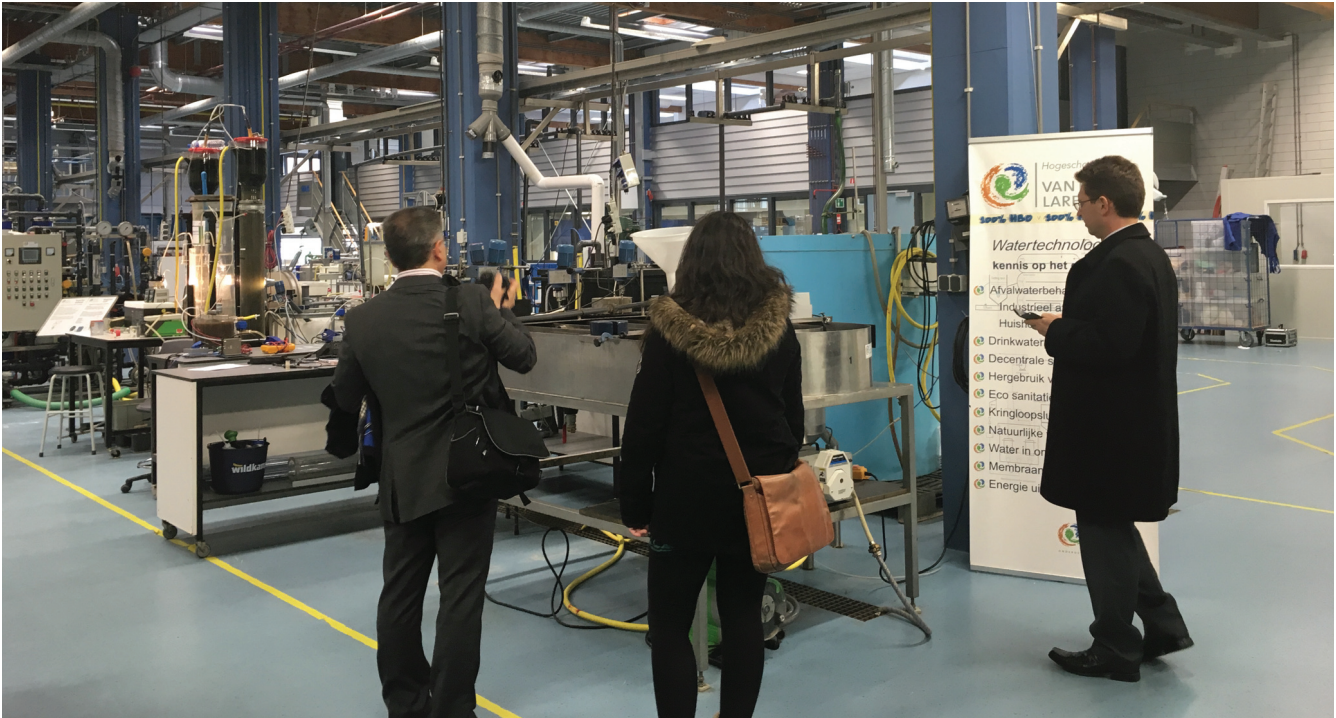
In December 2015, EIP Water conducted a first web-based analysis on various kinds of ‘water innovation hubs’ or ‘alliances’ as a basis for developing a first global overview. This initial overview was complemented with more data and more hubs in June 2016 as part of EIP Water’s ongoing effort to continuously identify all relevant hubs, analyse and categorise them according to various criteria, facilitate interaction among the hubs, and incidentally produce white papers.

The more than 60 global water innovation hubs are viewable at: www.eip-water.eu/resources

Demonstration sites show that many innovative technologies are already working

One major challenge, and thus a focus of EIP Water activities so far, has been demonstration sites for water innovation in Europe. EIP Water has identified some 300 demonstration sites across Europe where significant work on water-related innovation is taking place. They are featured on the EIP Water Online Marketplace – www.eip-water.eu – which connects people and projects in the sector, offers registered users the possibility to identify peers or other experts, and produces and disseminates regular updates on water innovation in Europe and beyond.

“Lack of information about demonstration sites is one of the barriers hampering the take-up of innovation,” says Guido Schmidt of the EIP Water Secretariat. “Thus we continue collecting demonstration sites all over Europe and inform about them via our online marketplace. In fact, many innovative water technologies are already working but many stakeholders just don’t know where to see a concrete example of what is already being tested and how it works.”



The following are just four examples out of the collection of over 300 demonstration sites:

- 1) Urban Green Roofs is a project in Helsinki, Finland. This demonstration site is a great opportunity to study the perspectives of biodiversity and ecological, social and economic sustainability on green roofs: www.eip-water.eu/projects/nwrm-case-study-122-urban-green-roofs-helsinki-finland/;
- 2) The Water Framework Directive Third Sector partnership working project in Wales demonstrates the meaning, understanding and the task of the Water Framework Directive, whose vision is to safeguard a sustainable environment for future generations: www.eip-water.eu/projects/water-framework-directive-third-sector-partnership-working/;
- 3) 'Rainsafe' in Ireland demonstrates the RainSafe™ machine, which treats harvested rainwater to drinking water standards by means of UV and ozone sanitisation with pre and post-filtration and brings it to the market: www.eip-water.eu/projects/safe-drinking-water-harvested-rain-water-rainsafe/; and
- 4) INAPRO is an EU-funded FP7 research project aimed at developing a model and demonstrating the application of aquaponics in different sites in Europe which can be visited: www.eip-water.eu/projects/inapro-innovative-aquaponics-professional-application

Proper water pricing as a support to innovation uptake

One key issue that regulators need to address in order to ensure that existing water technologies are taken up more widely is water pricing. In combination with increased research and innovation funds, correctly calibrated water pricing schemes could contribute financial resources to underpin innovation and experimentation. This would enable innovators in water 'to really go for the big challenges,' such as dealing with diffuse water pollution and addressing the rising demand for water for energy and crop production. Proper water pricing should also support the water management and infrastructure costs for the full lifecycle, including renewal energies.

Currently, water innovation does not attract the level of private sector funding that goes to, for example, alternative energy sources such as solar power, even though the availability of water resources has been identified as a top risk for the global economy. Effective pricing would create a 'much higher interest' in preserving and ensuring the usability of water resources, and would help to unleash the flood of water-related technological innovation. EIP Water supports the European Commission in preparing an 'Economic study on the benefits of EU water policy and cost of non-implementation' which will provide further guidance on this and several other topics identified by EIP Water as key challenges for driving water innovation in Europe.

The Secretariat of the European Innovation Partnership on Water

www.eip-water.eu
www.slideshare.net/EIP-water
 tweet https://twitter.com/eip_water



Ensuring that materials and products in contact with drinking water are fit for purpose presents diverse challenges, as PEN learned at an event in Brussels

Keeping it clean

The quality assurance of drinking water treatment equipment and materials remains an unsolved legislative issue. Article 10 of the Drinking Water Directive (98/83 EC) requires member states to ensure the hygienic safety of materials and products in contact with drinking water, but its implementation on a supra-national level also requires common agreements on market aspects for the free trading of drinking water products within the EU.

In an attempt to address some of these issues, a meeting entitled 'Materials and products in contact with drinking water' was held in Brussels in May 2016, which Pan European Networks attended. This event was held on the premise that 'the issue of safe, wholesome and clean drinking water is of outstanding importance for human health and therefore crucial for water services as well as producers of material and products coming in contact with drinking water'. Here, a group of European associations came together to discuss a new study launched by DG Environment on materials and products in contact with drinking water and various initiatives.

Meeting requirements

Speaking at the event, vice-president of EurEau (the European federation of national associations of drinking water suppliers and waste water services) Claudia Castell-Exner explained that drinking water is in contact with a wide range of materials and products from catchment to tap, and that since the current Drinking Water Directive entered into force in 2000, products and materials that come into contact with drinking water must meet the drinking water hygiene requirements stated in Article 10, with

The issue of safe, wholesome and clean drinking water is of outstanding importance for human health and therefore crucial for water services as well as producers of material and products coming into contact with drinking water

member states being responsible for implementing the directive. Additionally, certain products in contact with drinking water are also subject to the requirements of the Construction Products Regulation (CPR).

She continued: "In the absence of a functioning European-wide acceptance scheme for such materials and products, several member states have agreed upon common procedures, others have tried independent ways to fulfil the Drinking Water Directive's demands, and others still have not yet introduced any specific requirements at all."

Patchwork

Unfortunately, Castell-Exner said, this "patchwork" of national approaches has resulted in differences in the levels of consumer health protection on the one hand and potential barriers to trade on the other.

This situation, she argued, is not acceptable from the water utilities' point of view, with EurEau continuing to support approaches "that create certainty that materials and products offered on the European market are fit for purpose in technical terms, and also provide the hygienic safety needed to protect consumers' health during the whole lifetime of the products and in all of the processes within the water supply".

According to Castell-Exner, EurEau recognises and appreciates the efforts taken within the so-called 'four member states initiative' by Germany, France, the UK and the Netherlands, who have worked to "provide a solid basis for the approval and acceptance of schemes for drinking water materials and products". It also welcomes the fact that DG Environment has "accepted the very important task of reflecting on Article 10 of the Drinking Water Directive and has initiated a specific study on this subject".



© Petras Gagilas



“In the meantime,” she continued, “we have provided facts and figures to support DG Environment in their assessment, for example, with regard to the materials and products currently in use and their average life and service, and financial estimates for investments in new materials and products.”

Harmonisation

The harmonisation of standards on materials and products was also highlighted by the EurEau VP, who drew attention to one standard to determine hygienic requirements (which was published in 2014 as European Standard 16421) in particular. This, she said, looks at the influence of materials on water for human consumption and the ability of non-metallic materials to enhance microbial growth, describing three European testing procedures. The first of these, which was established in the Netherlands, analyses this ability by measuring adenosine triphosphate (ATP) as an indicator for biomass production potential; the second, developed in Germany, measures the biofilm volume; and the third, developed in the UK, takes the mean dissolved oxygen depletion in water as an indicator for microbial growth.

However, Castell-Exner continued, “one major gap at the moment concerns the next step after

Drinking water is in contact with a wide range of materials and products from catchment to tap

the standardisation of the testing procedures: the assessment of the test results”, and here there is a need to “decide on a set of limit values, on a set of acceptance criteria, and to decide whether the materials tested are safe or not”.

Challenges

Challenges nevertheless remain. The free movement of goods according to Article 34 of the Treaty on the Functioning of the European Union (TFEU) “implies that member states must not impose obstacles to trade within the EU unless they have strong reasons to do so. Having this in mind, an EU-level setting of hygienic requirements for materials and products in contact with drinking water is the constructive approach since member states’ specific requirements would contradict this European principle and would lead again to a patchwork within the European Union,” Castell-Exner explained.

“From EurEau’s point of view, this is a task for the European Commission,” she added, before recommending that while evaluating and reviewing the directive the commission takes the opportunity to “be inspired by the legislation on materials and articles intended to come into contact with food to tackle this subject”.

Castell-Exner concluded her presentation by arguing that “all of this valuable work can be used to properly implement Article 10 of the Drinking Water Directive” and, moreover, by emphasising that protecting consumers’ health in a sustainable way by supplying safe and wholesome drinking water will remain at the core of EurEau’s vision.

For this to be realised, it is clear that materials and products that come into contact with drinking water must be fit for purpose throughout their entire lifecycle.



Bruno Tisserand, the president of EurEau, explores the impact of the European Commission’s proposed Circular Economy Package, particularly regarding waste water and nutrient recovery

The water of the economy

This time last year we were eagerly looking forward to the European Commission’s announcement on the Circular Economy Package (CEP) to help European businesses and consumers use and recycle resources in a more sustainable way. The proposed actions, which were announced in December, will bring benefits to both the environment and the economy by extracting the maximum value and use from raw materials, products and waste, while promoting energy savings.

Overall, the new CEP proposal was well aligned with our position as it recognises how water services will contribute to a more sustainable European economy. We support the recovery of nutrients through the revision of the Fertiliser Regulation and new resource management instruments through the measures regarding water reuse.

Water and nutrients

As well as nutrient recovery, the circular economy has an important role to play in regards to water efficiency. Last year, we worked hard to advocate the possibilities offered by waste water and were successful in ensuring the European Commission included them in the package.

Waste water services are at the heart of nutrient recovery through biosolids and sludge-based products derived from sludge coming from waste water treatment plants. The CEP will stimulate the development of an EU-wide market for fertilising products originating from organic and waste-based materials. This is a strong signal to the European water sector to invest in the recovery of nutrients from sewage sludge. However, it is a missed opportunity not to have clearly defined end-of-waste criteria



Bruno Tisserand

for recognising high quality sludge-based materials and products as fertilisers instead of ending up in landfill.

Fertiliser Regulation

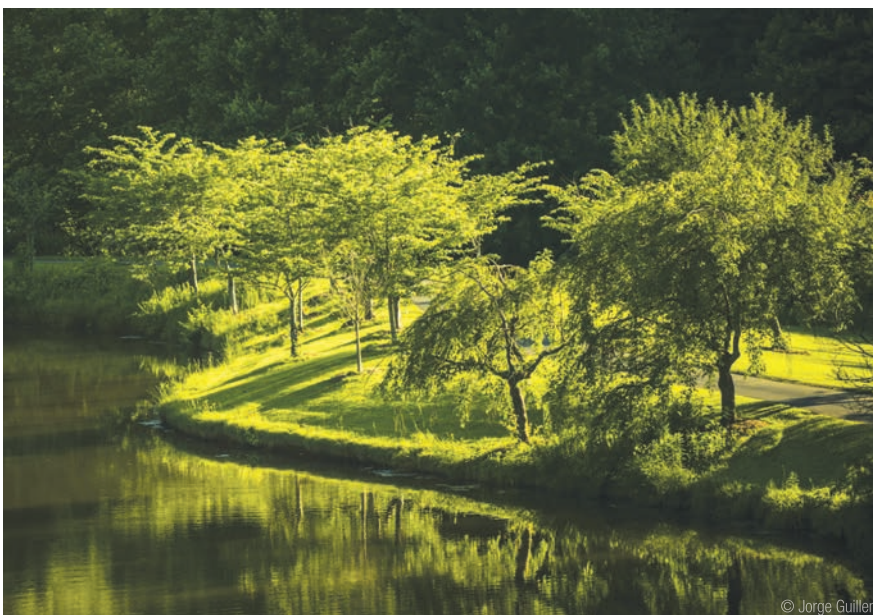
The details of the Fertiliser Regulation were published in March this year. The commission wants to significantly facilitate access to organic and waste-based fertilisers within the EU market, bringing them into line with traditional, non-organic fertilisers. This will create new market opportunities whilst reducing waste, energy consumption and environmental damage.

The regulation sets out common rules on converting biowaste into raw materials that can be used to manufacture fertilisers. It defines safety, quality and labelling requirements so that fertilisers can be traded across the EU. Producers will have to demonstrate that their products meet those requirements.

The key remaining issue is that some good quality products that can be obtained from sewage sludge in regards to the actual proposed criteria for compost and digestate will not be accepted by the present regulation. Indeed, the products are excluded from the regulation because they originate from sewage sludge. It is a discrimination made from the origin of the product which has no relevance considering the criteria imposed on the final product.

The Fertiliser Regulation, if the objective of creating a safe market for the recycling of nutrients is to be met, should focus on defining quality criteria for the end product that are safe for the end user and consumer, and without discriminating it from other fertilisers. It is not in line with the waste hierarchy, regardless of how good the product is, and it won’t be allowed on the market simply because it is coming from sewage sludge.

The European Commission announced the Circular Economy Package in December 2015



© Jorge Guillen



Raw materials

Another issue is the support for the market for secondary raw materials. From the proposal of the European Commission, the Fertiliser Regulation should promote the creation of a market by itself, because some products are allowed. The issue is that industrial processes, especially for the production of inorganic fertilisers, are set up with phosphate rocks imported from another part of the world.

These processes are not adapted to recycled products like struvite, originating from sewage sludge. For the moment, it is much cheaper to continue using phosphate rock, rather than adapting industrial processes to materials defined in the Fertiliser Regulation.

Therefore, incentives are needed to allow both sides of the chain (suppliers of recovered materials and fertiliser producers) to secure a market and invest in the adaptation of all processes to make the recovery of nutrients a reality. This is of the utmost importance if the European Commission wants to achieve its objectives of growth and job creation through the circular economy.

Waste water services are at the heart of nutrient recovery, says Tisserand

Water reuse

The second CEP specifically included water reuse. The proposal of addressing water scarcity through the reuse of treated waste water in safe, cost effective conditions is also a major step to maintaining water resources for all. It is a good tool to support the water reuse projects and raise the image of reclaimed water (water destined to be reused) towards end users by ensuring its quality and safety.

The potential role of reusing treated waste water as an alternative source of water supply is well-known. It can also provide significant environmental, social and economic benefits. Reuse can improve the environment by reducing the need for water abstraction and by reducing the volume of water expelled from waste water treatment plants into the environment. Reuse can also alleviate the effects of drought. This can be very beneficial to farmers as it assures a continuity of supply, reducing the risk of crop failure and income losses. Nutrients in treated waste water could also reduce the use of additional fertilisers, resulting in savings for the environment, farmers and waste water plant operators.

To obtain these advantages, the legislation has to establish relevant standards for relevant use – not all uses need the same water quality. To ensure safe use and viable projects from an economic point of view, it is of the utmost importance that the standards are adapted to the project use and defined in a regulatory framework. It makes no sense to ask for the same or more stringent water quality standards for drinking water than for drop irrigation of trees, for example. This would require unnecessary treatment and make the reuse project overly expensive.



JRC's benchmark

The Joint Research Centre is mandated by the European Commission to develop standards for reclaimed water. We hope that this proposal will be based on a global approach for reuse projects, balancing protection of human health and the environment whilst also allowing water reuse projects to take place. EurEau is asking for adapted standards, according to the use foreseen for the reclaimed water.

We expect the commission to publish its guidelines on water reuse over the summer and put forward a legislative proposal on standards by the beginning of 2017. We need to ensure that these guidelines are backed up by actual national legislation and that the standards will ensure a safe promotion of water reuse across Europe.

The commission has recognised the crucial contribution that the water sector can play in revitalising the European economy. Since water is the most important shared resource across all supply chains, and a lot of resources can be recovered from waste water, it is the natural starting point for the circular revolution.

Water is ready to be part of the circular economy. We need robust and comprehensive legislation from the EU to enable the CEP to be realised and compete with the 'business as usual' model. We – the water operators – work with the European Commission to bring legislation that is cost efficient and safe for people's health and the environment.

EU law review

The coming years are vital for the water sector, with several key EU laws coming up for review. The first of these is the Drinking Water Directive (DWD) and we have worked very hard to find solutions for the commission on the transparency proposals and the topic of materials and products in contact with drinking water. We have to be cautious, though, as enlarging the scope of the current directive beyond human health (Article 191 of the DWD) might jeopardise the clarity of the current legislation and undermine the legal certainty for EU member states and drinking water utilities.

A number of pieces of European legislation relating to water are set to be reviewed in the near future

Customers' demands and needs should be given the attention they deserve, but the current DWD might not be the right legal instrument to address issues concerning the management of water services or water governance as a whole, since the current DWD establishes obligations towards EU countries in terms of health parameters to be met.

Evaluating urban waste water

The Urban Waste Water Treatment Directive (UWWTD) will be evaluated soon. Issues such as the management of combined sewer overflows, the way compliance is monitored and a clear definition of discharge are all topics that could be addressed more precisely. The UWWTD is often seen as an expensive directive, and it is, but it is also a major instrument to address the pollution generated by cities across Europe and it has helped to improve the water quality of our rivers and lakes.

Some new objectives need to be set to further reduce the impact of urban areas on the environment, but we mustn't forget that cities are one amongst other polluters at the river basin scale, and that their contribution is only responsible for a part of the ecological status of receiving waters. We hope the European Commission will soon publish its timetable for the evaluation of the UWWTD and that water operators will be able to contribute to this work.

Finally, the Water Framework Directive will be reviewed in 2019. EurEau members have already held discussions and are producing detailed work for the review. The WFD is key to supporting sustainable water services effectively.

We will work with the European Commission to create reviews that continue to protect consumers and the environment so that we can continue to enjoy our cities and rural areas, as well as safe, clean water and food, for years to come.

Bruno Tisserand
EurEau

www.eureau.org



PEN looks at the benefits and challenges of organic farming, and why it may be more important than ever

Growing importance

In a number of studies, organic farmers have cited weed control as a barrier to production. Without the use of pesticides, it is generally impossible to entirely remove weeds; instead, farmers must control their growth and spread as best they can. Some common practices include sowing seeds of fast-growing crops which compete with weeds for water, sunlight and other resources. Crops such as oats or buckwheat can create cover, which deprives weeds of nutrients and sunlight, starving them without the use of pesticides.

Another option is the selective application of fertiliser, which ensures that nutrients are placed closer to the roots of the crop, where they are better absorbed by the crop than weeds that are competing with it. Otherwise, removing weeds on an individual basis is an option, but this can be excessively time consuming and only targets larger weeds that have already taken root, not those seeds which have yet to sprout.

Nonetheless, there are major advantages to organic farming: changing crops on a yearly basis and planting more diverse crops can replenish and enrich soil. This has become ever more necessary with the rise of maize as a crop that is grown for the purposes of anaerobic digestion, a procedure which creates biogas for energy. There were 186,000 hectares of maize grown in 2015, and there are proposals for a further 125,000 hectares before 2020.

The Soil Association warns that maize plants lead to high levels of soil degradation, can cause damage to streams and rivers, and take up land space that could be better used to grow food. In the UK, maize growers receive government subsidies, something which the



organisation vehemently disagrees with. Peter Melchett, the Soil Association's policy director, said: "Maize crops can do serious damage to soils and fresh water. The fact that farmers and anaerobic digester operators are being paid to harm these vital resources is a national scandal. ... It is possible to grow maize to better practice standards that reduce the risks to soils and the environment – some farmers are following good practice, but not enough of them. ... What is crazy is subsidising the use of good quality farmland to grow crops that damage soils and rivers to produce subsidised energy that creates rather than reduces environmental problems."

It is possible that a reduction in maize growth and renewed efforts to encourage farmers to become more organic in their practices could prevent further environmental damage, while continuing to counter global warming through the use of sustainable energy sources. The Soil Association argues that more investment is needed from the UK government to ensure that better farming practices are adopted so that farms can begin to make a more positive impact on the environment.



BioSeedMat benefits

Terraseed Ltd is working on alternative weed control that is chemical free, organic, and will bring benefits to horticulture

Weed control has become a serious issue to farmers and growers as pesticides lose their approval and are withdrawn. One UK company, Terraseed Ltd, has been working on alternative, chemical-free and organic methods of weed control that are set to provide a cost effective solution for a wide range of horticultural crops.

Many readers will have heard about the plight of bees and its alleged association with neonicotinoid insecticide treatment, or of the threatened withdrawal of the general purpose herbicide glyphosate, which is widely used in commercial agriculture and for weed control in gardens. But few will be aware of the likely impact of pesticide withdrawals on crops like carrots, onions and salads that are now difficult to grow on a commercial scale without their most effective herbicides for weed control.

The regular review process for agrochemical approval has been ongoing for many years, but the more recent switch from a risk-based to a hazard-based approach to safety has been a game-changer, and the horticultural industry is slowly coming to terms with the impact of losing critical agrochemicals and reeling from the likelihood that others will follow.



The Agriculture and Horticulture Development Board (AHDB) in the UK undertook a detailed review of the likely impact of further agrochemical withdrawals and concluded that some crops will be difficult to grow on an industrial scale, especially if the most severe interpretation of the hazards is adopted. The loss of herbicides alone in some critical crops is likely to see a loss of farm-gate sales of between €100m and €1bn a year across Europe. Crops such as salad onions could become uneconomic unless there is a pool of very cheap casual labour for hand weeding. Mechanical hoeing and other high-tech solutions can be used for crops that are spaced well apart in rows (e.g. cabbage), but where crops are grown at high density in beds, or close together in rows, then hand labour is the only way forward for many growers.

It was against this background that Terraseed developed a range of seedmat products for industrial horticultural use that provide excellent weed control for high density salad crops; however, none could be registered as a certified organic input being manufactured from expensive air-laid paper bonded with artificial (non-organic) adhesives. This limitation is not a problem for high value conventionally grown crops, but our seedmats were competing against conventionally grown crops that used herbicides, which is a much lower cost option.

Despite the limitation on Terraseed's early seedmat products, we have licensed a very large grower in Denmark, Yding Gront, to manufacture and distribute our seedmat products. We developed the machinery and have benefitted from manufacturing royalties, but have not yet realised the potential for more licences, because of the difficulty of getting organic registration and the availability of alternative chemical weed control. Now that key herbicides have been withdrawn, we believe the market will demand a new cost effective solution, and Terraseed aims to provide it.





To address the issue, we won a Horizon 2020 feasibility study to develop and commercialise BioSeedMat – our novel, cost effective approach to weed control in both organic and conventionally grown horticultural crops based on a biodegradable paper-seedmat.

Product benefits

BioSeedMat consists of a physical barrier made up of two laminated biodegradable membranes containing seeds placed in between these two layers. The absorbent bottom layer retains water and controls weeds, enhancing germination rate and uniformity. Whilst preventing weed germination beneath the membrane, developing crop roots are able to germinate and penetrate this membrane into the soil. The top membrane is typically made from biodegradable tissue paper materials which degrade in a few days, allowing crop shoot development. It holds the seeds in place and prevents soil contamination. The pigmentation of the membranes alters the wavelength of light entering the upper layer of the soil, creating a photosynthetic environment that is unfavourable to weed seed germination and development. When combined with the physical property of the mulch, this creates the most effective suppression of weeds. Seeds are strategically placed between these two layers for optimum harvest potential – in rows, broadcasted or with precision placement.

The two layers of the mat are held together with biodegradable adhesives that may be used as a carrier for active ingredients such as germination stimulants, fertilisers and oxidising agents to promote rapid and uniform crop establishment. After the crop is well established the seedmat completely biodegrades in the soil. We can control the level of degradation of the tissue paper to suit different crops.

The seedmat rolls are provided in different sizes according to customer needs, but can be up to 400 metres by two metres wide. These seedmats can be laid mechanically in the field or by hand under glass or polytunnels.

Field laying is fast and efficient. It involves unrolling a prepared seedmat followed by a sand or compost spreader. The mat is covered with a thin layer of sand or compost that protects the seedmat from wind damage, maintains good contact between the seedmat and the soil, and ensures that the mat remains moist. Laying under glass or polytunnel is typically performed by hand as the product does not need to be covered with sand and the edges



of the seedmat do not need to be buried to avoid wind damage. The mat can therefore simply be unrolled on the core provided.

Since the seedmat degrades before harvest, mature crops can usually be harvested using unmodified harvesting equipment. Therefore, no extra expense is needed. Many configurations are possible to suit different applications. Precision seeding enables accurate seed rate and row spacing. The patented paper-seedmat system and products are available for conventional farming, salad and vegetable production, for herb production and for the forestry industry.

BioSeedMat works well when cut into narrow strips or when laid across the full width of the bed and so can provide an effective solution to the elusive in-row weed control problem that has been such a challenge for other mechanical methods.

The Horizon 2020 feasibility study has highlighted several issues that need to be addressed to make BioSeedMat a commercial success. Most importantly, it is to work with the paper mills to engineer an air-laid paper using starch-based adhesives that will be acceptable for organic farming. Following discussions with our partners, we believe that this is achievable. Our next issue is to get the unit cost down so that a wider range of crops can benefit from the technique; this involves replacing the sand used for covering with something cheaper and more effective. Once again, working with our partners we believe we have a solution to this which we have now patented.

Having resolved the technical and cost limitations we believe the BioSeedMat has the potential to provide farmers and growers with a cost effective alternative to herbicides and hand weeding for both conventional and organic crops. Our next steps are to develop more end user and distribution licences.



David Holloway
Managing Director
Terraseed Ltd

+44 (0)1256 889966

david@terrased.com
www.terrased.com

PEN highlights the work of groups driving innovation in eco-friendly drilling technology

Core developments

Drilling is at the forefront of exploratory efforts into the Earth's subsurface, which could stand to have a great number of economic and scientific benefits. Among the potential developments are breakthroughs in the use of geothermal energy as a renewable source and an ability to more accurately predict the effects of carbon dioxide emissions in climate change. The European Commission has also highlighted drilling efforts as a priority, although with an acknowledgement that environmental concerns must be taken into consideration.

There remain challenges with improving the technology that empowers excavations, but there are a large number of groups driving ecologically friendly drilling innovation on both land and sea throughout Europe, working within the commission's directives to ensure that the environment can be investigated at the same time that it is protected.

Ocean drilling

The European Consortium for Ocean Research Drilling (ECORD) is a group of 16 European countries, along with Canada and Israel, which formed in 2003 to join the International Ocean Discovery Program (IODP) as a single member. The organisation built upon previous international collaborative efforts to bring together a number of consortia representing 26 nations in total, in an attempt to use ocean-going research platforms to recover data from the seafloor and to monitor underwater environments.

Among ECORD's efforts are the promotion of the IODP science plan, which runs from 2013-2023 and looks to address key scientific questions using ocean drilling research. The plan began development in 2009 at the INVEST conference in Bremen, Germany, which saw 600 scientists gather from 21 nations to establish a number of priorities for ocean drilling research. The plan was subsequently drawn up and revised by scientific leaders from IODP member countries and consortia, who brought expertise from climate modelling, geology, geophysics and other

relevant sectors to propose research focus areas for ocean research.

The organisation's goals include investigating the geologic record below the seafloor, which extends beyond the ice core records available from recent ice ages to more distant time periods when atmospheric CO₂ was closer to today's levels, and in some cases to the even higher levels that are predicted if temperatures continue to rise. Ocean drilling allows the possibility of exploring such conditions at nearly all latitudes, and by comparing conditions on Earth to those of past time periods with similar or higher atmospheric CO₂ levels, scientists could find new avenues within climate research and offer far more accurate predictions about the effects of global warming. The efforts of the IODP in climate science could improve estimates of global climate sensitivity to greenhouse gases, predict losses in the ice sheet and rises in sea levels, and discover the key chemical processes that are being underrepresented in climate change models.

Earth's upper mantle

Another of the IODP's key priorities is a large-scale investigation into the composition, structure and dynamics of Earth's upper mantle. The mantle extends from the base of the rocky crust to the top of the metallic core, and is crucial for understanding the history of the planet, as all of the oceanic crust and much of the continental crust is derived from partial melting of the mantle rock. Thus far, most investigations into the Earth's mantle have used samples gathered from digging close to the surface, or from rock fragments brought to the surface by volcanoes or by deep faults, from which evidence was gathered suggesting that the upper mantle is highly variable in composition.

The IODP hopes to develop new drilling technology in tandem with progress made in science to launch drills from the base of the crust which will penetrate the upper mantle along multiple drilling trajectories. This will provide lateral drilling which ensures

Boreholes become exponentially more expensive as they reach further depths





© Lydur Skulason

heterogeneity among the samples, and will maximise the volume of material gained from each borehole, allowing for analysis of the mineralogical and geochemical history of the mantle, and thus contributing new available data to efforts to track the history of the Earth's crust.

Geothermal energy

Improved drilling technology could also be used to improve access to renewable geothermal energy, according to research published by the European Commission's Strategic Energy Technologies Information System. Layers of rock which are hot enough to be exploited to produce electricity are found all over the world, but usually only at depths of over 5km. The extreme conditions under which drills must operate when accessing these depths push the limits of currently available technologies, but investments from the Horizon 2020 funding programme into ultra-deep drilling innovations could offer new opportunities to exploit these power sources.

In particular, an alternative is sought to rotary drilling, which uses diesel-electric rigs arranged inside each other to create a natural taper but which become exponentially more expensive as they drill deeper, and as drill bits need to be replaced. While improvements to drilling technology are constantly being made, even new innovations are not proven for use at the extreme conditions of more than 5km depths.

Housing for a geothermal borehole in Iceland

One technology which looks to revolutionise drilling efforts in the future uses a newly developed pulse-plasma and ultrasound cutting tool attached to a long, coiled tube. The tool spins as it is lowered into the hole, and pulses break up the surrounding rocks without touching them, meaning there is no need to regularly replace the bit. Water is then pumped through the tube, which forces disintegrated rock to rise to the surface.

Environmental impact

Taking into consideration the potential environmental impact of drilling is a key element of the European Commission's Environmental Impact Assessment Directive, which asks governments and companies to perform impact assessment checks before drilling operations are undertaken. Earlier this year, the commission announced it would refer Poland to the Court of Justice of the EU for failing to adequately perform such assessments during some drilling projects. Under Polish law, drills down to a depth of 5,000m need not be assessed for potential environmental impact before they take place, but by the commission's directive, drills deeper than 1,000m must be assessed. Therefore, the commission argues, Poland's law fails to take into account all of the relevant criteria and standards established by the directive, and the country has not acted responsibly by failing to ensure that appropriate assessments took place.

Under the directive, deep drillings need to be assessed in terms of the waste they produce, the effects that they could have on water and soil in the area, their use of natural resources, and any effects they may have on other projects in the area. Further, developers must adjust projects or introduce mitigating measures into proposals to ensure that no lasting negative impacts occur during drills. By referring Poland to the Court of Justice, the commission has demonstrated the importance it places on environmentally sound drilling across the continent.

Taking things underground

Going underground with sophisticated infrastructure solutions aided by new drilling technology developed for hydropower

Norhard AS, established in 2007, is a full service provider for drilling and lining of penstocks for hydropower plants. It enables environmentally friendly solutions through game-changing drilling technology based on in-house development and production. This technology is now in operation at 14 hydropower plants with a total production capacity of approximately 150GWh of clean renewable energy.

Through the successful delivery of approximately 11km of commercial drilling and lining solutions under various conditions, and for various customers, the game-changing technology has proven its worth.

The technology, and equipment it helps to build, is in place for the use of remote controlled, full profile directional drilling of tunnels with a variety of diameters up to 1.5m. Tunnels constructed in hard rock can be drilled over distances of up to 1.5 to 2km.

Advantages

Norhard technology is enabling substantial advantages compared to traditional technologies available in the onshore market:

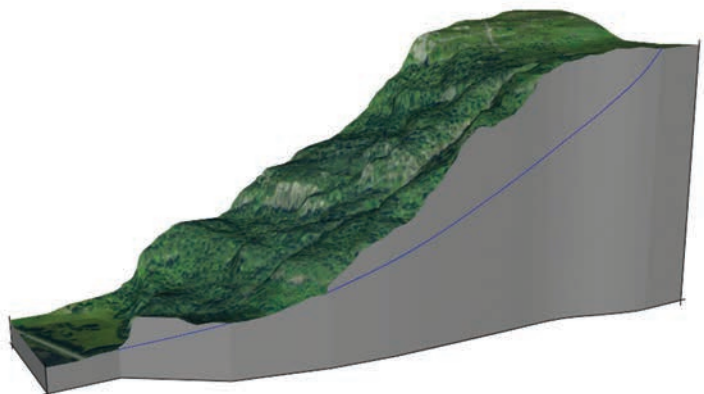
- Energy is transmitted from surface equipment to the borehole assembly through electric cables;
- High capacity communication through fibre cables attached to the drill string;
- Integrated systems for online navigation and steering makes it possible to drill in curves and follow predefined trajectories with a very high grade of accuracy; and
- Reduced energy consumption provides for substantial reductions of surface equipment and better HSE characteristics.

For hydropower plants it is advantageous to establish underground penstocks from the lower part of the terrain and link them directly to the intake level without disturbing the sensitive landscapes at higher levels. The power of environmental friendliness and cost efficiency given by Norhard technology allows the construction of hydropower plants that would have not been possible to build otherwise, due either to environmental or technical challenges and high construction costs.

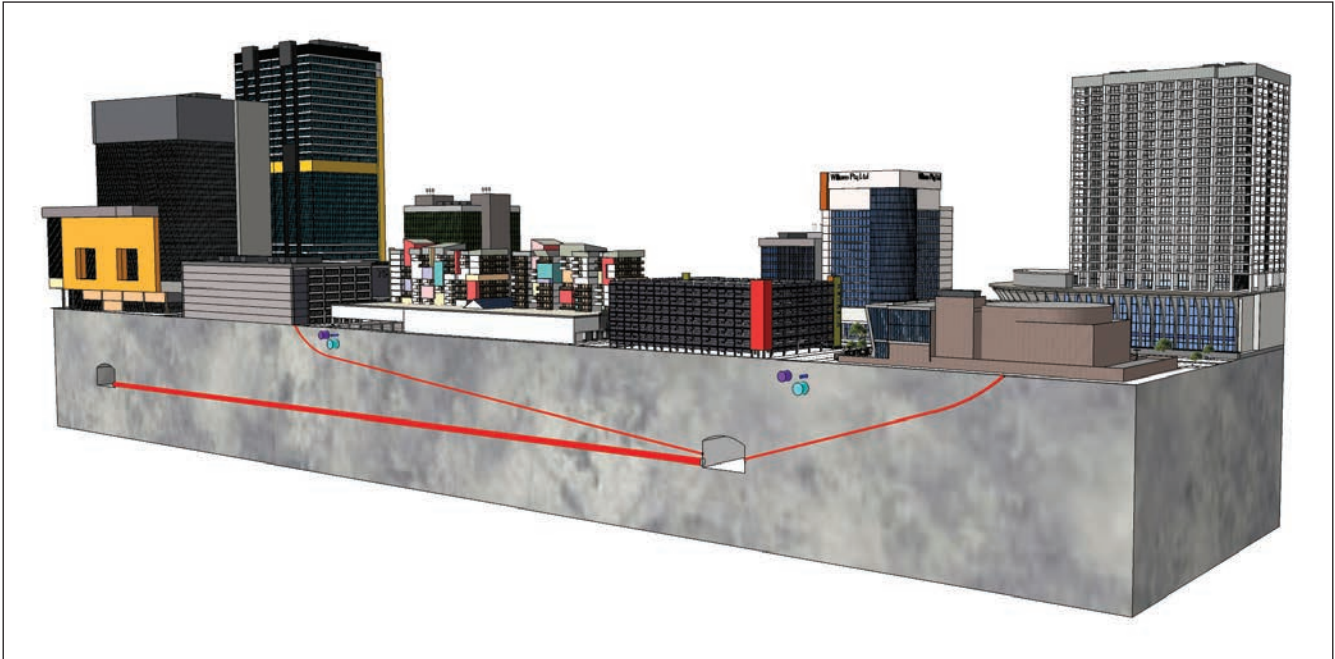
Some unique characteristics for Norhard technology include:

- Static drill strings (no rotation);
- Fully electric operation;
- Online high capacity communication over fibre cables attached to the drill string;
- Integrated systems for navigation and steering;
- Continuous circulation;
- Energy efficient;
- Environmentally friendly solutions and performance – no emissions and near-silent operation;
- Prepared for integrated, forward-looking seismology; and
- Flexible drill string.

In parallel with focusing on the commercial introduction of the technology in the initial market of penstocks for small hydropower plants, comprehensive studies have been ongoing to adapt the technology for other markets as well. Some of the works have been supported by funding from Innovation Norway and the Norwegian Research Council.



Accurate pre-defined trajectory and accurate pre-defined point of breakthrough



One tunnel or borehole can be used for several purposes. For lower voltages and other infrastructure utilisations, the technical challenges related to framework conditions can be lessened and the advantages and cost savings are obvious

Future focuses

Based on gained experience, comprehensive dialogue with leading companies and research institutions within the Norwegian oil and gas industry, descriptions for further utilisation of the technology are already in place – such as NODIG and applications within the oil and gas industry, as well as for deep geothermal wells.

However, the short-term focus for the company is now contributing to the general trend of taking things underground i.e. NODIG and trenchless cities and landscapes. The fact that more than half of the world’s population are living in cities, and that the public’s focus on sensitive landscapes is increasing, leads to the demand and need for more sophisticated underground systems. Norhard technology is important for the further development of efficient underground systems for many purposes and applications:

- Supply systems for gas, water, district heating, power and telecommunications;
- Disposal systems for waste, sewage and drainage; and
- Relocation of overhead lines to underground.

Provisional limitations are that boreholes have to be established in hard rock and on inclinations of three degrees and upwards. Work is also underway to adapt the systems for horizontal and downward drilling as well as for combined structures – soils and hard rock.

- Point to point systems over lengths up to 2km – further lengths can be achieved by ‘sewing’ in series; and
- Several small tunnels can be drilled from a bigger conventional tunnel or underground hall for distribution of one or more applications utilising the same main system.

Long distance directional drilling with a high grade of accuracy in trajectory and continuous position logging combined with built-in,

look-ahead seismology, is opening up for new innovative solutions. Complex, as well as simple, systems can be established or replaced without disturbing existing systems and activities, underground as well as aboveground.

The ability to utilise boreholes for high voltage infrastructure gives rise to some additional theoretical and practical questions. A study – assigned by Norhard and carried out by SINTEF – based on the relocation of a portion of a 400kV overhead line over a distance of 1.8km addresses the practical questions related to installation and operation, as well as thermal conditions and costs. The study verifies the utilisation of a 1,500mm diameter borehole for 420kV cables with the same capacity for transmission of energy as a 420kV overhead line with Duplex Parrot FeAl nr. 481.

In some cases, and if calculating the costs of not having the actual line, extra costs of such solutions might show great saving potential if all the aspects involved are considered. New technologies and the unavoidable demand for taking things underground will lead to new kinds of solutions and stimulate more sophisticated technologies, systems and materials.



Askjell Tonstad
CEO
Norhard AS
Norwegian Hard Rock Drilling

+47 91186437

at@norhard.no
www.norhard.no



The European Construction Technology Platform's Luc Bourdeau outlines how the ECTP serves as a European forum promoting innovation in the built environment

Sustainability where we live

The European Construction Technology Platform was set up in 2004 by the construction sector at the request of the European Commission, and is today one of the 38 European Technology Platforms (ETPs), which are industry-led stakeholder fora recognised by the European Commission as key actors in driving innovation, knowledge transfer and European competitiveness.

In May 2015, the ECTP achieved a new step to meet its strategy by developing into an association (AISBL under Belgian law). It gathers around 160 member organisations from the construction and other sectors of the whole supply chain of the built environment, which has been agreed as the major purpose of the ECTP. The built environment is a place of tightly interconnected private and public infrastructure. Its composition and dynamic are very complex since it offers and is associated with a lot of various services which support our day-to-day life. The built environment serves a lot of industries and services (transport, energy, tertiary sector, dwelling, health and care, the silver economy). It therefore impacts the performance of many sectors and our major living environment; this is the place (homes, offices, transport infrastructures, cultural places, schools and universities, hospitals) where we spend more than 80% of our time. Its quality as such directly impacts the quality of our life. Last but not least, paramount challenges such as energy, climate change, efficiency, safety and, more generally, sustainability have been proven to be of the utmost importance for the built environment, and very often need to be tackled within an integrated approach.

The main mission of the ECTP and its five committees dedicated to selected specific challenges is to build on new research, development and innovation strategies to improve competitiveness, meet societal needs and take up environmental challenges through an innovative built environment. The ECTP mobilises stakeholders to deliver on agreed priorities, share information across the EU, and facilitate the industrial exploitation of research results. The ECTP is an independent and self-financing entity which conducts its activities in a transparent manner and is open to new members.

Energy efficient buildings

Energy efficiency in buildings is a crucial challenge for Europe since existing buildings represent the highest amount of energy consumed in the EU (about 40%) and this sector is also the main contributor to greenhouse gas (GHG) emissions (about 36% of the EU's total CO₂ emissions).

Indeed, new buildings constructed today are very energy efficient thanks to new technologies and systems which can lead in practice to nearly zero energy buildings, or even to buildings which can produce more energy than they consume. However, addressing the refurbishment of existing buildings (including historic ones) is predominantly critical in order to fulfil the decarbonisation goal of the European economy, if we consider that by 2050 more than half of the existing building stock will still be operational. This is posing tough technical challenges requiring innovative approaches and solutions, which are addressed as core objectives of the Energy-efficient Buildings cPPP supported by the commission with €600m funding within H2020.

Infrastructure and mobility

Green, smart and cost-effective infrastructure should be developed in order to further increase



the performance of multimodal transport. How to reduce the environmental footprint of infrastructure and improve its resilience while maintaining its overall performance, how infrastructure may contribute to alternatively fuelled vehicles, and how to promote the implementation of infrastructure are some of the issues to be solved. Continuous, efficient and resilient quality of service will make infrastructure a major contributor to improving the transport system, but the impact on the environment and on energy consumption should be reconsidered and adequate measures should be implemented to reduce the negative ones and increase a positive contribution.

A major long-term ambition of the ECTP is kick-starting an initiative that paves the way to enhanced technology transfer and mass market development for innovative materials, components, systems and processes supporting the pan-European generalisation of advanced multimodal infrastructures.

Materials and sustainability

Materials constitute the basic element to construct the various components of the built environment. Durability, environmental impact and comfort of living are some of the keywords considered by the ECTP to tackle the sustainability issues related to materials.

Material durability is a key element to improving the performance and lifespan of buildings and infrastructures. Durable materials contribute to increasing energy and resource efficiency and reducing GHG emissions and overall lifetime costs.

Improvements in raw material and energy consumption, as well as the utilisation of construction, demolition and other waste, offer a huge potential to minimise the environmental burden of the construction industry.

At last, health, hygiene and aesthetics are paramount regarding the future generations' requirements for the buildings and structures we live and work in. The knowledge on these issues is insufficient, and research and innovation are needed in order to fulfil these requirements.

Heritage and regeneration

Built cultural heritage has a high societal importance: quality of life in cities, the feeling of social safety and cultural identity are

closely related with the presence of heritage buildings. It improves welfare and the wellbeing of people in urban areas. Built monuments constitute a significant value in the context of urban development and an important source of economic revenues through cultural tourism and the creative economy.

The ECTP promotes new sustainable and preventive strategies, concepts, methodologies and techniques for the conservation and restoration of cultural heritage in order to promote economic development and improve the quality of life of citizens and the attractiveness of Europe, particularly its cities, buildings, monuments and landscapes.

It follows a knowledge-based and interdisciplinary approach to the sustainable protection of cultural heritage underpinned by the principles of safety, authenticity and compatibility to ensure minimal intervention. It also includes the integration of cultural heritage into the natural and urban environments to tackle a common management of the whole environment.

Active ageing and design

The demographic shift is a matter of global concern that needs little introduction. The number of people aged 60 years or older will increase from 900 million to two billion between 2015 and 2050 (moving from 12% to 22% of the total global population). The built environment, enriched with new opportunities of digital innovation, matters crucially in enabling new forms of support and creative expression for all ages.

The ECTP takes a fresh look at innovation and scale of smarter new built and retro-fit built environments. It sets up a research, innovation and valorisation agenda in close alignment with the European Reference Framework for Age-friendly Housing to help unlock the social and economic potential of providing inclusive, smart built environments across the union. It currently supports the commission's Roadshow for Age-friendly Housing with expertise, dissemination and facilitation activities, including the co-hosting of two national innovation workshops about age-friendly housing.

A conference to exchange

The 7th ECTP open conference will take place in Brussels on 17-18 November. This event will be dedicated to the present and discuss current and anticipated innovation in the built environment field. Plenary sessions with high-level speakers from academia, industry and the European Commission will introduce the global scheme and visions from various stakeholders. Meanwhile, thematic parallel sessions will address diverse specific issues under the five current challenges of the ECTP. A hall for booths and posters will exhibit examples of innovation expected from European projects.

Luc Bourdeau
ECTP Secretary General

www.ectp.org

The need for sustainability

Construction is the linchpin of most European economies and consumes vast quantities of natural resources. Kirsten Henson, director of KLH Sustainability, discusses the changing nature of the industry

The nature of the construction industry is changing, albeit slowly. The change is mainly driven by technology, increased urbanisation, the shifting value system of many young people and the need to create a more sustainable, stable economy. The construction industry is not known for disruptive innovation, and those that work closely with the industry know that even incremental innovation can be challenging. This track record can be attributed to a number of factors, including: the persistent fragmentation of the industry, inadequate collaboration with the supply chain, difficulties in attracting young, diverse people into the industry, and a reluctance to honestly share learning between projects.

This is the area in which KLH Sustainability acts. We are facilitators. We collaborate with the full construction value chain from clients to engineers, from product suppliers to contractors, from university researchers to schoolchildren. We are therefore conduits of knowledge from one project to the next, from one tier to another, from infrastructure to buildings.

The built environment legislative landscape

It is currently a turbulent time for Europe as a whole and the UK in particular. Investment in UK infrastructure and buildings faces considerable uncertainty and, even if the investment returns, without free movement of people providing critical skilled labour to an under-resourced industry, the UK may face further challenges.

KLH Sustainability believes that legislation does not impose a burden but is a key driver in stimulating industry transformation that would benefit society and the environment. The UK, until recently, had some of the most ambitious construction legislation in Europe.

The culling of legislation began in 2015 with the withdrawal of the Code for Sustainable Homes. A new non-regulatory standard

for homes, the Home Quality Mark, is only voluntary and it remains to be seen how many planning authorities and clients adopt the standard.

The loss of the code was compounded by the retraction of the government's commitment to zero carbon homes by 2016 with the associated fabric efficiency standards, renewable energy support and off-site allowable solutions. The announcement was a shock to an industry that had invested in research and development over ten years to ensure they were prepared for the legislation. As yet no announcement has been made on zero-carbon non-residential provision by 2019.

The removal of legislation is supposedly intended to increase Britain's productivity, but at what cost to society and long-term resilience?

There is, however, some positive movement. The Modern Slavery Act 2015 is a recent piece of legislation that is causing waves in the construction industry. It endeavours to encourage transparency and accountability within the supply chain, something the industry has been paying lip service to for some time. It is no longer acceptable to use ignorance or complexity as an excuse to disregard the role of bonded or slave labour in products in the UK and Europe.

Organisations with significant resources and purchasing power are in a unique position to influence global supply chains, and while we may not see tenants refusing homes or offices that cannot prove an ethical supply chain, experience from the retail market suggests that major investors may indeed remove funding with significant impact on share prices.

Where next for the built environment?

A drive to improve the energy performance of buildings has resulted in once-fringe technologies becoming mainstream, at least where energy prices are high. Triple glazing, heat recovery and integrated solar photovoltaic solutions are all now commonplace in some countries. Widespread adoption has helped to bring the prices of these new technologies down, although work is still needed to translate that into UK investment decisions.

As we work towards low energy buildings, the embodied energy of construction becomes proportionally more significant. Consider also that the UK built environment accounts for 60% of UK materials consumption and one-third of all waste. It is estimated that over 10% of materials delivered to construction sites goes directly into skips without even being used. Such waste involves a significant loss of valuable minerals, metals and organic materials. With such huge quantities involved, small improvements will have significant impacts.



Eastwick and Sweetwater, Credit: Sheppard Robson

The circular economy is now common parlance in sustainable construction; however, as with many great principles, implementation is a challenge. Building information modelling (BIM) has been heralded as a principal tool for construction efficiency, but many of the micro and small enterprises that comprise the construction industry are not able to invest in the training and software needed to deliver it. BIM will not solve the vast quantities of packaging waste generated on construction sites, and poor management combined with programme delays will still lead to excessive, waste-generating rework.

We also have yet to see the concept of asset tagging in BIM for end of life reuse of building components be fully explored. The reuse of steel beams has always been challenging as engineers rightly demand to know the provenance and lifecycle loading on the beam. Concrete suppliers are reluctant to recycle old concrete into new concrete aggregate without knowing the original mix design details and exposure. Careful asset tagging and records could enable end-of-life value to be maintained within construction products and support a true circular economy in the built environment.

The industry must also address growing concerns around climate change. In the UK, the design response predominantly needs to address anticipated hotter, drier summers and wetter winters. Balancing the risk of overheating with delivery of air-tight, energy efficient buildings is a challenge, as is dealing with the potential of more frequent and intense winter storms resulting in flooding. Due consideration of natural cycles and biomimicry in the planning and delivery of new infrastructure and buildings and the incorporation of green infrastructure are critical for resilience and occupant wellbeing.

It is in this environment of big ideas and concepts that KLH Sustainability thrives. We know that sometimes disruptive technology is a step too far for traditionally conservative construction businesses and that high-level concepts need to be turned into practical solutions for delivery.

Who are KLH Sustainability?

We are fortunate in working with the thought leaders as well as the followers. We pride ourselves on targeting the right sustainable solutions depending on the appetite and experience of the client and the marketplace. Sustainability has never been a 'one size fits all' approach.

Our clients are spread across the construction value chain, from large developers through to aggregate suppliers. This gives us a unique insight into how to set deliverable strategies for sustainability and to ensure successful implementation.

We maintain strong links with Cambridge University and other research institutions to ensure that we take advantage of new emerging ideas, as well as inspiring a new generation of engineers and sustainability professionals.

Our current portfolio includes a number of world-leading projects and research.

Following on from KLH Sustainability's considerable work on the London 2012 Olympic Park, KLH continues to support the Olympic legacy through the delivery of 1,500 zero-carbon homes,



Angerstein Wharf, London

community facilities and amenities within the Queen Elizabeth Olympic Park. KLH Sustainability has been engaged by the developer to ensure the development meets the London Legacy Development Corporation's challenging sustainability objectives including: zero-carbon homes, 15% reduction in embodied carbon, climate change resilience, biodiverse landscapes and smart cities for community benefit.

KLH Sustainability has also recently conducted an extensive research project for The Crown Estate. The project aimed to evaluate the sustainability benefits and impacts of aggregate selection, using sound scientific research and consultation with industry to dispel the misconceptions about recycled aggregates being the default sustainable solution. KLH developed an alternative approach to assess sustainable aggregate sourcing, focusing on three criteria: local availability of aggregates, social impact of transportation, and carbon footprint. The proposed methodology adds to the body of knowledge around this important construction resource, and we are currently in discussion with the Building Research Establishment to determine how this piece of research may influence the BREEAM (BRE Environmental Assessment Method) criteria.

Many of the solutions for a sustainable built environment are within reach; all that is missing to bring about the necessary transformation is action. KLH Sustainability provides the will, the technical integrity and the communication across traditional project silos to deliver award-winning solutions.



Kirsten Hanson
KLH Sustainability Ltd
+44 (0)7879 690097

kirsten.henson@klhsustainability.com
<http://www.klhsustainability.com/>



© Chris Anderson

Diederik de Stoppelaar, secretary general of LightingEurope, discusses some of the main challenges facing European smart lighting innovators and lighting's role in the circular economy transition

Lighting up Europe

From being more energy efficient to improving performance, smart lighting, i.e. light that interacts with the environment around it in an 'intelligent' way, boasts a number of advantages over traditional lighting. Through sensors and controls embedded in the technology, smart lighting offers higher quality light that can adjust to the user's needs, optimise vision, boost concentration and alertness, influence mood, maximise comfort at home and at work, enhance ambience and increase safety – in many cases without even flicking a switch.

Its benefits are important: on average, people spend around 90% of their lives in buildings, with light having a significant effect on their mood, productivity and wellbeing. It seems obvious, then, that the European Commission would make smart lighting a key target area as it looks toward a smarter, more sustainable and more inclusive future.

To gain a better picture of the European lighting industry today, PEN spoke to Diederik de Stoppelaar, the secretary general of LightingEurope. As an industry association, LightingEurope represents the voice of more than 1,000 lighting companies who employ over 100,000 people across the continent. Its daily mission is to advocate and defend the lighting industry in Brussels while reconciling it with ongoing EU policy aims. In doing so, the association is dedicated to promoting efficient lighting practices for the benefit of the global environment, human comfort, and the health and safety of consumers.

Here, de Stoppelaar discusses some of the main challenges facing European smart lighting innovators, explains why regulation isn't always bad, and sets out the role of the European lighting industry in the transition towards a circular economy.

What are the greatest challenges facing smart lighting innovators at the moment?

How do we incorporate 'smart' into lighting and not the other way around – that's the biggest challenge. Smart is everything to do with the internet of things, which is something we are all facing and are all worried about because it isn't yet something that we really understand. The lighting industry is still in 'investigation mode', so to speak – we're still trying to figure out what opportunities 'smart' might give us.

It'll be important we make sure that lighting is still the main element and isn't eclipsed by the smart factor. After all, it isn't simply about being able to change the colour of the lights, it's about having the best experience possible with the



© Ramdion

highest quality of light possible, and that's the key. Otherwise, you could just put lights in the ceiling and everybody would be happy, but that's not what we want. We want the highest quality of light possible, and that's both the biggest challenge for us and the biggest opportunity with smart lighting.

One of the things highlighted in your Strategic Roadmap 2025 – which sets out LightingEurope's vision of the European lighting industry over the next decade – is the lengths a European innovator has to go to in order to bring their creation to market in comparison to someone importing a product developed outside of Europe. What action can be taken to improve the regulatory framework to benefit European innovators?

People complain a lot about regulation and say it's not necessary, but I think it's good that the lighting industry has regulation. On the one hand, the regulatory process actually helps us because it makes sure that we can continue to deliver the high quality lighting that our consumer and end users have become used

More efficient lighting has reduced CO₂ emissions by close to 200 million tonnes

to. Regulations also help to create a level playing field whereby everyone is playing according to the same rules – that's another positive. Added to that, while we are not against any imports, imports do not create jobs. As the European lighting industry, making our luminaires here in Europe means that we can keep Europeans in employment. That's a very important aspect of the regulation process.

Of course, regulation has to be in line with what is going on in the world around us. It shouldn't mean any kind of theoretical ban to keep pace with certain energy-saving wishes that we have, which is a little bit the case now with lighting. Lighting has been saving energy since the 1980s and is a very good example for other sectors to follow. All the big savings have already been done, anyhow – if you've reduced the wattage from 100 to six, saving another half a watt isn't going to make any real difference. So, yes, a little regulation can be good and important, but we are only in favour of it if it's there to ensure the quality of the light and keeps the end user in mind.

Another key topic highlighted in your roadmap is the link between smart lighting and the circular economy. How do you see smart lighting playing a role in this key ambition?

I'm glad you have mentioned this because it's something that always seems as though it's quite far away. Most of the time, we talk about energy saving and then we start to talk a little bit about smart lighting, or the hype around it. The next thing we want to start talking about is human-centric lighting, which recognises the human as the most important factor and concentrates on improving quality of life, and the fourth thing is the circular economy, which is a really hot topic in the EU



and Europe more widely right now. The commission wants industry to pay more attention to the circular economy, and we support it.

In my opinion, the circular economy is a really fantastic initiative which could have a real impact for our children, our grandchildren, etc. As an industry, we believe that we should first of all make clear that we believe in the circular economy, and second demonstrate that we are taking our responsibility seriously. After all, if we as an industry don't take care of our environment, why are we trying so hard to make energy savings etc. in the first place? In the lamp world we are very active on the environment. To give you an example: the recycling and collection of fluorescent lamps has been going on for years and was an initiative of the lighting industry. We now believe that we should be looking into light fixtures, too, and not only how we are going to recycle and collect them. We really want to extend our responsibility in the context of circular economy.

You mentioned using human-centric lighting to help enhance quality of life – in what ways can different lighting systems have an impact in this way?

Lighting can do so much more than everybody thinks it can – people assume it's just a bulb with an on and off switch, but actually, especially given all the possibilities we have with LED lighting, it can have a huge impact. It will have a really positive effect on older people, for example, by improving the lighting in elderly care homes and thereby creating a better atmosphere to live in. We can utilise lighting in hospitals as a sort of medical cure for certain skin diseases or to help treat depression. In schools, we can use it to improve children's

concentration and thereby their performance, and we can increase employees' energy levels in the workplace.

We, of course, believe all this should be done in a smart way, and that comes back to the question of regulation, particularly with regards to data. It's great if we can use light as a data transmitter, but what about the security of that data? Who owns it? All these questions are still to be answered, but we do know for sure that the days of lighting being simply a bulb and a switch are well and truly over.

That makes what is happening at the moment so exciting, but also a little bit chaotic. Lighting has always been a readily accepted part of our lives. We've always had light – we're afraid in the dark. But now all of a sudden, lighting will be more than just light: it'll be a transmitter, it'll be an opportunity to improve health, it'll be an energiser, and it will be a whole load of other things too, some of which are still in the very early stages. We're still investigating all the possibilities in universities and research centres, but there's undoubtedly so much more going on with lighting than in the past. That's the amazing thing.

You've spoken previously about the ban on inefficient halogen lightbulbs, which has now been delayed by two years to 2018. What impact do you foresee the ban and its delay having?

The delay is very important because consumers still have a lot of halogen luminaires, for example in their ceilings or their desks, and by banning the lamp you cannot use those luminaires anymore. What you see is that people start buying loads of lamps just before the ban, which isn't very good, because all it means is that they continue to use those lamps.

LightingEurope has actually been involved in helping to shape the commission's decision with regards to the delay. We would prefer to see a regulated delay, which would allow us to educate the consumer and inform them that they need to start changing their lamps, adapting or buying new ones. Alternatively, we could develop retrofit lamps in order to accommodate the luminaires that still exist, but all these things need time.

Efficient lighting is resulting in annual consumer savings of €85bn in Europe



Lighting and Europe – by the numbers

- According to LightingEurope, on a sunny day, people outside get around 100,000 lux (light intensity) and on a cloudy day 10,000 lux; meanwhile, office workers indoors receive 500 lux and school students just 300 – people spend 90% of their time indoors;
- Lighting today accounts for less than 15% of total electricity consumption in the European Union;
- Lighting is a key sector for the European economy with a market size of around €17bn and a workforce of around 150,000;
- Worldwide, Europe is at the forefront of the lighting industry, including in solid state lighting, with a share of around 30% of the global market;
- LED lighting is expected to grow at an annual rate of more than 30%, from a market share of just 19% in 2013 to a market share of 54% in 2017;
- Efficient lighting is resulting in annual consumer savings of €85bn in Europe and has reduced CO₂ emissions by close to 200 million tonnes; and
- LightingEurope estimates that human-centric lighting could yield European benefits of up to €12.8bn by 2020, increase productivity by 4.5%, reduce errors by 1% and decrease absences by 1%.

In my opinion, banning lighting products is not a good thing; I am not in favour of it. The market takes care of itself – if we would just let it do what it needs to do, halogen would leave the market as well. It isn't because of a ban that we won't sell any more halogen. LEDs will replace 80-90% of all existing conventional lightbulbs. It's only natural that new products replace old ones. We don't need any big regulations on halogen, especially because it will only lead to parallel imports from the Far East.

What further steps can be taken to realise sustainable and smart lighting in terms of regulation and RDI?

There are a lot of amazing things going on in smart lighting, but we are still in the early stages. We don't yet know exactly what opportunities are there with regards to lighting and the internet of things, for example. We're learning – very slowly – how to walk, but we aren't running yet. There are still some people who talk about smart lighting but don't really 'do' smart lighting, and there are a lot of people who are very active in smart lighting but don't get the attention that they should do as well. That will change; I am very confident of that.

Diederik de Stoppelaar
Secretary General
LightingEurope

www.lightingeurope.org/

With pedestrians distracted by their mobile phones whilst crossing tramways, one German city has taken a dramatic step to improve safety. PEN speaks to Stadtwerke Augsburg's Stephanie Lermen to discover more

Cross safely

The increasing use of smartphones by pedestrians is leading to some tragic consequences. In the spring, a 15-year-old girl was killed by a tram whilst using her smartphone in the German city of Munich. Fortunately, lighting technology is now being pioneered to help safeguard so-called 'texting zombies'.

One solution being instigated is 'smartphone traffic lights'. This initiative sees special LED lights installed in pavements which are designed to protect smartphone users when they attempt to cross tramlines. The lights also warn pedestrians when a tram is approaching the crossing, as well as informing them when it is safe to cross the tracks.

The LED lights, which have installation costs amounting to €10,000, are visible from a distance and have so far been installed at two locations in the city of Augsburg – at a tram stop on Haliagh Street and near an overpass next to a stop on Parseval Street. Whilst the scheme has generally been well received, there have also been criticisms that it is a waste of public money.

A similar initiative to safeguard mobile phone users has been introduced in the southwestern Chinese city of Chongqing, where a pavement has been divided into lanes, including one specifically designated for pedestrians using their phones. Meanwhile, a staircase at the Student Life and Wellness Centre at Utah Valley University in the United States has also been split into lanes, namely one for walkers, another for those running up the stairs, and one for those that are texting.

To find out more about the smartphone traffic lights project in Augsburg, Pan European Networks spoke to Stephanie Lermen, press secretary at the public transport company Stadtwerke Augsburg. She provided an insight into the background of the scheme, the reaction of local



Stephanie Lermen

residents, and how the initiative could be further developed.

What is the driving force behind Augsburg's smartphone traffic lights?

Around the city of Augsburg we have had accidents involving pedestrians using their smartphones and crossing tramways. As a result of an accident involving a young girl and a tram in Munich, we decided we had to take action, focusing on the need to get the attention of pedestrians and inform them that they just can't cross the tramlines. We found we had to advise pedestrians of when they are approaching a tram crossing and consequently developed the smartphone traffic lights.

We have installed LED lights in the pavement to inform passengers when it is safe to cross. When a tram is approaching, the pedestrian signal turns red at the crossing, whilst the lights in the pavement flash red to get the attention of pedestrians and encourage them to stop. When it is safe to cross, the pedestrian signal and the lights in the pavement both go out.

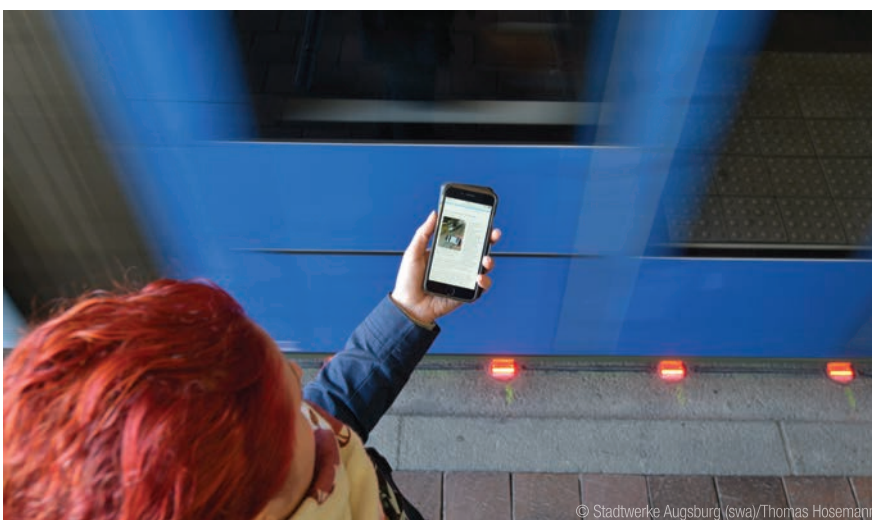
At one of the spots where we have installed the LED lights, pedestrians are unable to hear the tram approaching, particularly when a regional train service is leaving the nearby station because the train is so loud.

Furthermore, when passengers arrive at the railway station, they can sometimes rush for their tram if they see it is waiting – they just forget everything and run, and don't check to see if a tram is travelling in the other direction when approaching a crossing.

How have the smartphone traffic lights been received by local residents?

There have been some critical voices stating that it is too expensive, whilst others have said that the lights are 'just for people who don't know how to behave' when crossing tramlines.

Looking down? Pedestrians being distracted by their mobile phones is leading to accidents on the tramways



© Stadtwerke Augsburg (swa)/Thomas Hosemann

However, the technology doesn't just benefit smartphone users – it is for the entire general public. We received a very nice email from a pedestrian who is vision-impaired, and he stated that the smartphone traffic lights are really helpful. He still has the sense of light and dark, but acknowledged that he can see the flashing lights and can locate where the crossing is.

On the whole, people who are usually against something are those that voice their opinions – we have received around 20-25 entries on Facebook and about five emails. Consequently, in my mind, it's really been well received.

What does the city government think about the installation – do they consider it to be a good investment?

The city government hasn't said anything against the project, so I think it has been pretty welcome.

It has also been very well received by our tram drivers – they are in favour of anything that gets the attention of people approaching a tram crossing as they have to approach the crossing very carefully, too, and there are now fewer so-called 'shock moments', for example, people running onto the lines.

What are the next steps for the smartphone traffic lights, and what other projects are being developed?

If the test is successful, we expect that we will install more of these lights – it is relatively simple to do. Furthermore, the LED lights in the pavement are charged wirelessly.

We have also installed a specific lighting information system to notify passengers about the departure of trams at Augsburg Central Station. When trams arrive in the evening, a green light is used to inform passengers that they will be able to get to their trams in time. But, if there's less than a minute to go before the tram leaves, a flashing green light is used. When the tram has departed, a blue light is used.

This system really informs passengers of whether they will be able to get to their tram in time or not. We hope to replicate this installation at other tram stops, too, but this is a future ambition.

The red lights warn pedestrians using their mobile phones of oncoming trams and when it is safe to cross



© Stadtwerke Augsburg (swa)/Thomas Hosemann

What goals does Augsburg have in transforming itself into a smart city?

Most decisions have to be made in City Hall – we can only provide the impulse to take action.

As a company, we provide electricity and have particular involvement in changing energy usage. We try to be smart and are providing smart products for the residents of Augsburg. At the moment, we have a smart microgrid product which involves smart meters and includes special offers for those residents that are involved – we are investigating whether a smart grid could work in a small area of the city.

We are also undertaking a larger research project called 'Csells' which covers about three or four federal states in Germany, as well as undertaking some research regarding heating with the hope of doubling the life of the grid.

Overall, smart solutions go hand in hand with decisions – we can't just provide the products, politicians in City Hall need to take action as well.

Stephanie Lermen
SWA

www.sw-augsburg.de

LED dimming re-defined

There is more to dimming street lights than energy savings. Combined with modern optics and a new approach, self-adapting road lighting systems will soon be turning a corner

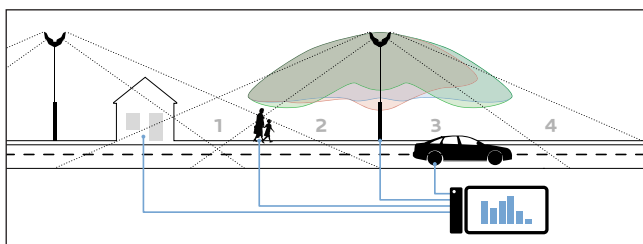
'Sophisticated technology', the 'internet of things' ... long gone are the days when simple offline systems were sufficient. Lighting is no different, and with the possibilities of LED technology, there seems to be nothing that cannot be done. There is wide consensus in the lighting field that 'smart lighting' is one of the next big things in the street lighting sector. As Bob Parks wrote in the 17th issue of *PEN: Government*,¹ it is not the switch to LEDs alone but the dimming that is the key to saving energy and money.

And dimming is already here. There are sales people walking around with smartphones, demonstrating the possibilities to control individual luminaires wirelessly. While this is of course impressive, questions can be raised as to whether or not this is sensible or even legal. Wireless dimming of one or two luminaires can be done by almost any engineer with a hobbyist's Arduino board and a SIM card. Developing a dimming system capable of gathering information on thousands of luminaires, ensuring lighting quality, road safety and energy efficient operation, is an entirely different challenge.

The challenges

Then how should we control street lighting? Oy MTG-Meltron Ltd, a Finnish company specialising in diffractive optics for general lighting, and dealing in the very technical areas of lighting, such as road and street lighting, has a different approach compared to most of its competitors. Meltron's focus is on road safety and lighting quality. When it comes to dimming, the main question is not how much one can dim and save, or with what technology, it is how can lighting be improved with control systems?

Of course, dimming technology matters as well. There is much confusion in the lighting field, brought about by hundreds of companies all offering their own best thing and lobbying for completely unnecessary design specifications, such as IP68 ratings for garage lighting. The customers are left alone with the dazzling light shows, accompanied by technical jargon and data



Meltron's road and street lights offer adjustable luminous distribution by means of a wireless multi-channel dimming system, allowing optimisation of illumination for each street

that have very little to do with luminaire performance and even less with the end result – illumination.

When it comes to the dimming of street lights, there are a few important things to remember. Firstly, LED luminaires are here, and they should be dimmed using ways that are suitable for them, not 'as has always been done'. Secondly, wireless systems are also coming, but wireless data communication is not without problems. The step from dimming a couple of luminaires to tens of luminaires is already big. The step from this to hundreds or thousands is massive, even impossibly complicated to be realised with some network structures, and even the big lighting players are having trouble building reliable network solutions.

Even if the dimming technology worked perfectly, the challenge of how, when and how much to dim still remains. There are many ideas, some, like motion sensors, adapted from indoor lighting, that are being discussed, developed and tested, but which are more likely to bring discos to the streets rather than provide good quality lighting. In most cases, lighting is installed for safety and comfort, so even when you dim, you should try to avoid reducing or losing safety and comfort.

The solution

One of the key features, as Meltron sees it, is to provide tuneable optics, i.e. to be able to control the luminous distribution of the luminaire, not just the intensity of a fixed distribution. The optics in its MRS system is designed in a way that allows optimisation of the output, via multichannel dimming, and a better optical fit for each road. Instead of a luminaire family, the same fixture can be wirelessly adjusted for most roads requiring luminous fluxes between 5-20klm. The idea is you can fit all poles in town with the same fixture, then wirelessly adjust them to give the optimal output on each road section.

The current street lighting standards (EN13201) provide a good basis for setting quality criteria for road lighting, although with the onset of LEDs there has been some debate as to whether these requirements could or should be updated as well. According to these standards, for a driver in a typical car the lanes must have a minimum luminance, luminance uniformity and low enough glare. For each road, a speed limit is set and likely traffic densities identified, which then define the lighting requirements for the road.

However, the difference between the standards and reality is that for the standard driver, who is set to be 23 years old, there are no pedestrians, car headlights, intersections, traffic rush hours, or snow storms to account for. A wet road surface is the only thing that is considered, and even for that, the minimum target uniformities are significantly lowered because a luminaire can't be

optically good for both dry and wet roads. The reality is complicated, periodic and also forever changing. Traffic conditions, and type of use, change during the day. Cities keep building and replacing old with new, and advances in vehicle technologies are expected to revolutionise the transport industry completely. A fixed output luminaire with basic dimming can bring energy savings but cannot meet these dynamic requirements for illumination.

The ability to change the luminous distribution of a street luminaire allows the operators to define multiple lighting classes, instead of just one, and change the lighting requirements depending, for instance, on traffic densities. Using weather sensors, the uniformity on wet roads can be improved. Together with modern measurement technologies such as luminance imaging video cameras, lighting energy use and luminaire maintenance can be optimised, and over-driving eliminated over the installation's lifetime. In addition, multi-channel control and supporting optics allow design errors to be fixed without changing the luminaires, and for new road surfaces with changed reflective properties, the lighting can be re-adjusted for an optimal fit.

Why does this matter?

Firstly, it is good to understand what a long way there still is to go for good road lighting and that, in fact, there is no such thing as a 'one for all' solution. Intelligent dimming and LED technology can tackle things that are not even considered requirements yet.

Secondly, lighting is about illumination, not luminaires or dimming protocols. Of course, it is important to discuss whether, for example, the DALI (Digital Addressable Lighting Interface) protocol, originally designed to pack a large amount of dimming signals into a couple of wires in large building installations, is the best protocol for street light dimming. Luminaires with DALI can produce good visibility just as well as ones without it.

Even though some research suggests there is no correlation between street lighting and traffic collisions or crime, good lighting does improve visibility and counteract the negative effects of headlight glare. Some statistics also show that pedestrian deaths occur much more commonly during night time, and not many would say they feel safer where there are no street lights. So, good visibility is what matters.

Summary

Ensuring good illumination on a global scale and on all types of roads requires a wide portfolio of luminaires, significant lighting design efforts, and information from the field that is rarely available during the design phase. To provide high quality energy-efficient lighting everywhere at all times, a dynamic system – something where you not only dim the lights but also provide adjustable optics – increases the opportunities to provide good visibility and cost savings.

It is one thing to dim lights to achieve energy savings and a completely different thing to meet the lighting quality, safety, aesthetics and energy efficiency targets for different types of roads. Traffic volumes, driving speeds and weather conditions are key to how much there is to see, and how well we can see it. Being able to adjust not only luminance levels but also other lighting quality parameters accordingly is important. With self-driving vehicles likely to be common in a couple of decades, these requirements for visibility might be significantly different.



Improvements to lighting parameters, such as uniformity, are possible without changing fixtures

Meltron's idea is to offer an easy interface into its luminaire which anyone developing new dimming hardware or software can connect to. For one company to be the best (and keep being the best in optics, network and server technologies, user interface design, street lighting, traffic monitoring and so on) is not possible. At Meltron, we see a true need for combining optics with lighting control systems, and lighting control systems with sophisticated traffic surveillance systems. Optics is our specialty, and the rest we leave for others to provide solutions for. The current generation MRS system is equipped with light source units and power supply design, supporting the luminous distribution control via our partner's compatible control systems. Meltron's goal is to provide the best optics, integrated into a reliable luminaire, with an interface ready for anyone to adjust it as required.

1 <http://www.paneuropeannetworkspublications.com/GOV17/#100>

MELTRON

REMOVING DARKNESS

Jaana Jahkonen
Chief Technology Officer
Oy MTG-Meltron Ltd

+358 (0)9 6226 550

info@meltron.fi
www.meltron.fi

With global levels of synthetic turf ‘field replacements’ on the rise, attention is turning to the options for turf at the end of its useful life; the Synthetic Turf Council shares a point of view

Limited options

What happens to synthetic turf once it reaches the end of its useful life? What options are available to avoid landfill? One of the challenges the synthetic turf industry is working on is determining how best to manage the removal and disposition of synthetic turf once it has reached this stage.

With the volume of synthetic turf being removed from fields in the United States increasing each year and at an all-time high for 2016, the options for recycling are still limited. It is estimated that about 940 fields will be removed in 2016, and that number will top 1,000 in 2017. The process and protocols are evolving and need to do so quickly. Yet, addressing the afterlife of synthetic turf surfaces feels like a new fledgling industry. To help field owners and consultants plan for the field surface renovation, the Synthetic Turf Council (STC) is working on updates to existing guidelines on ‘Removal, Recovery, Reuse and Recycling of Synthetic Turf and its System Components.’

Council impact

The Synthetic Turf Council’s Reuse & Recycling Task Force has gone back to the beginning with this update. It is starting with definitions related to synthetic turf and infill for: recycle, reuse, repurpose and recover. The taskforce felt strongly that this was needed to get everyone using the same references and not mixing terms. These definitions will be published soon as part of the update to the guidelines to recycling synthetic turf later this year. The definitions are in draft form and are in the process of being finalised.

It is important to frame the issue, for example with recycling:

Recycle: A series of activities by which material that has reached the end of its current use is processed into material utilised in the production of new products (according to the US ‘National Coalition of Recycling’). Processing typically involves the removal of contaminants and/or size reduction to satisfy specifications.

Example: The infill is recovered from a synthetic turf field during deconstruction. It is then processed to remove rock, dirt and other contaminants, and graded and tested to satisfy mesh size/distribution specifications and used as feedstock to make a new product.

Any true recycling programme of synthetic turf will need to meet the laws and standards of the local and federal environmental regulators. The new post-consumer products must meet both state and federal government regulations for total metals and leachates.

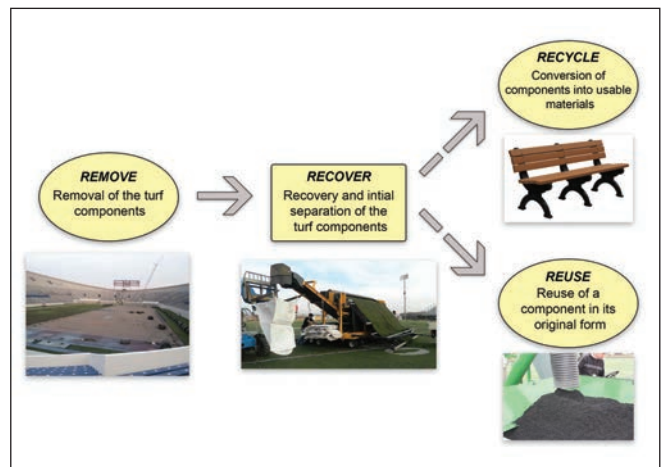


David Nardone

Only a handful of contractors have even chosen the recycling option over landfilling. This choice is a simple one when disposal costs outweigh recycling costs in a particular region of the country they operate in. It is very important for the field owner and the public to understand reuse is not recycling. Companies have popped up advertising low cost or even free recycling when they are actually attempting to reuse the turf, selling them to a new user. Reuse in some instances is a good thing, but field owners should not be misled. A percentage of field owners require recycling, and once the field leaves the facility this is not always the case. Fields are being sold for reuse without their owner’s knowledge and some are even being warehoused.

Supporting owners

As part of the guideline update, the taskforce is also looking at the planning and preparation procedures that owners should perform for field replacement. Owners need to know the type of field system they are attempting to recycle. If one does not have documentation on the field system they should consider testing the materials, fibre, backing, infill etc. Infill should be tested in either case to understand its quality. Currently, if the turf is being recycled,





The council is producing guidelines to aid in the recycling of synthetic turf

the infill is often reused. In most cases separating the carpet and infill happens on site as part of the turf removal.

The owners or their consultant should research the companies that offer recycling. There are currently a very small number of companies offering certified recycling. These same companies are considering additional facilities to help mitigate the shipping costs. These facilities will be built once the number of field replacements increases. These facilities need a consistent supply of turf carpet to make the facilities viable. Mitigating the shipping cost is key to getting closer to a cost-neutral recycling option.

Removal of turf taking place



Founded in 2003, the Synthetic Turf Council is a 501(c)6 non-profit trade association dedicated to serving as a resource for trustworthy information about synthetic turf. Our objective is to encourage, promote and facilitate better understanding among all parties involved in the manufacture, selection, delivery and use of today's synthetic turf systems. To that end, we make every attempt to dispense information that is neutral, objective and validated by independent, science-based, current and credible research.

A key component of certifying the reuse and recycling process is documenting a proper chain of custody for the synthetic turf. The document should include the following information: owner and project name, container or truck number, seal number or bill of lading number, arrival date at job site, departure date from job site, date shipped to recycling facility, and completion date of recycling. Third party verification is also available and can be included in the chain of custody. A reputable recycler will have a chain of custody document as part of their process. It should at a minimum contain the information outlined above.

Recycling challenges

The synthetic turf carpet is a complicated product to recycle, and this is hindering its progression. The different turf systems are made up of varying polymers in different combinations. Synthetic turf is produced from several polymers. Even perfectly clean turf contains a mix of LLDPE (linear low density polyethylene), PP (polypropylene) and a coating of either polyurethane, hot melt polyolefin, or latex. Linear low density polyethylene is used to produce the majority of turf fibres, the largest component of turf. Nylon and polypropylene are also used, but to a much smaller degree. Polypropylene is typically used for the backing material, but backing is a smaller component than turf fibre. These materials can be melted together but may form a polymer mix with distinct phases. Heterogeneous polymer alloys can potentially be used as recycling content in some processes, but will have mechanical properties that are different and likely inferior to virgin or recycled polymers from single components.

There is still a long way to go to see all of the synthetic turf fields being recycled as a matter of course, and the current rate may mean we need government regulations to make recycling happen across the board.

David Nardone
Principal and Sport Group Lead
Stantec

Member of the Board of Directors
Synthetic Turf Council

www.syntheticurfCouncil.org



Dr Jean-Luc di Paola Galloni, co-chair of ERTRAC, met with Pan European Networks at the TRA 2016 Conference in Warsaw to discuss the issue of sustainable transport in Europe

Good advice

The European Road Transport Research Advisory Council (ERTRAC) is the European technology platform which brings together road transport stakeholders to develop a common vision for road transport research in Europe. The road transport sector involves a wide range of industries and services from vehicle manufacturers and suppliers to infrastructure providers, mobility management, communication technologies, energy companies, and many others. Road transport, integrated with the other modes of transport, enables mobility for people and goods across Europe. ERTRAC thus aims to provide a framework to focus the co-ordinated efforts of public and private resources on the necessary research activities.

Pan European Networks met with the PPP's co-chairman, Dr Jean-Luc di Paola Galloni, at the Transport Research Arena 2016 Conference in Warsaw, Poland, to discuss the issue of sustainable transport in Europe and the role that ERTRAC and the European Green Vehicles Initiative (EGVI) can play.

What do you feel are the biggest hurdles to be overcome if a sustainable transport landscape is to be achieved?

At ERTRAC we are primarily concerned with the research and development challenges. We are an industry-led platform, and perhaps one of the biggest research challenges that has been identified thus far concerns the surface transport sector. Our platform has worked to remove some of the most significant hurdles when it comes to road transport, and is continuing to do so, but others remain.

Perhaps one of the biggest research challenges that has been identified thus far concerns the surface transport sector

Crucial to what may be widely termed 'sustainable transport' is decarbonisation, and it is clear that there is now a considerable amount of engagement with this from a variety of stakeholders and that the necessary technologies are now being developed, with many of the technological hurdles having been overcome. However, there is still room for improvement in terms of battery technologies for full electric vehicles, for instance.

At the global level, there is a battle taking place for the leadership of this sector, and we are now beginning to see that the demands are increasing – something evinced by Tesla's recent announcement that the company had already taken a significant number of orders for its Model 3 sedan – on a market that has not yet ensured improvements in the available battery technologies.

Our platform at ERTRAC has worked on several improvements on Li-ion batteries and has already established a scheme for research on post Li-ion batteries after 2020, and we are looking to develop a battery pack that is less expensive, more efficient and more reliable, and that brings more autonomy.

Additionally, there is also a need for further research into fuel cells, where a more complex combination of hurdles exists. Firstly, as the recent terror attacks have shown, there is a danger being posed by extremists, and hydrogen refuelling stations would present a very vulnerable target to terrorists committed to disruptive and murderous acts. We continue to hope that this threat will be curbed, but the fact will remain that hydrogen will be susceptible to any such activities. Alongside the security issues posed by the combustibility of hydrogen, it must also be noted that its introduction as a fuel will be relatively slow.

Another important area outside of efforts towards decarbonisation concerns automation





© Håkan Dahlström

and safety. There, the complexity stems from the combination of what the automotive industry needs to bring together with non-automotive sectors such as ICT, infrastructure, land usage and public policy. Here, there is a clear need for harmonisation and standardisation, not only in Europe but globally – otherwise things will be very complicated and much more costly. A dialogue working towards this end has already begun.

In this sense, the European Commission's DG Connect, DG Move and DG Research are all now working to bring forward a seamless and progressively automated transport system. Not only is this a question of road and surface transport; it also brings into play ideas of intermodality, where there is an increased emphasis on work across boundaries towards an environment where data is shared and transferred from one mode to another.

For example, there is an obvious need to reduce the number of cars in city centres and to ensure there is enough car parking available close to public transport. In order to achieve this, and to develop a transmodal transportation system, it is absolutely necessary to have seamless data transfer from cars, from train station platforms and from other areas, which will alert users to delays or to a lack of available parking spaces

There is still room for improvement in terms of battery technologies for full electric vehicles

in a given area, meaning that they will avoid a wasted journey to that part of the city. This needs to be done together with those in charge of traffic management and with the providers of such services in the city setting.

Indeed, we are now beginning to witness the emergence of the power of city mayors and city-related data management in this regard, but, on the other hand, it is important that any pilot initiatives in these areas are able to demonstrate what lessons can be learnt so that we are then able to eventually see what can be left independent, as business models, and what can be more harmonised and standardised.

Technology-wise, we are now drawing close to the threshold of automation, which is based on LIDAR, radar and sensors that are now being developed and produced at a reasonable price. There is also a push for automation coming from the consumer and, while many of the specialists are saying there is a push for the 'Uberisation' of certain types of mobility, it is also true that the push towards automations contributes to that.

As such, it is important to pay attention to the pilot activities that are happening throughout Europe and what they achieve – many of these will perhaps initially concern the automation of surface transport in settings such as airport terminals.

In terms of enhancing safety, there is a link here with automation – even if it is hard for public opinion to visualise it yet. Indeed, automation has the potential to drastically reduce the casualties and fatalities caused by surface transportation. More than 85% of the current fatalities are attributable to human behaviour, and semi or fully automated vehicles will be much safer as they remove the human factor. This is a feeling shared by many city mayors and member state governments throughout Europe, and, moreover, work is also being done to link this enhanced safety to the

potential reduction in costs and impact on hospitals and national health services as well as on GDP; the increasing automation of transport stands to have a tremendous benefit in a wide variety of ways.

Overall, when it comes to the idea of ‘sustainable transport’, at ERTRAC we believe in our strategic research agenda, within which there is a focus on public transportation systems, which is an area where we need to develop many management systems as well as enhance safety. The hurdles here again concern the development of more harmonised systems between the different independent actors, which also need to be allowed the right degree of freedom. This therefore also relates to the gathering and sharing of data.

The reliability of transport is central to our ongoing efforts, and we have not quite reached the optimum point yet so we are continuing to seek out the most seamless process. This may require a change in the business models and behaviours of different actors. That, of course, takes time.

What role can the transport sector play in helping Europe to achieve its climate goals, and what needs to be in place for this potential to be truly realised?

Transport is responsible for a quarter of the EU’s emissions and also produces some NO_x (and SO_x in the maritime sector). We now have clear strategic roadmaps in place for both the technology and deployment to reduce the level of pollution and emissions that come from the transport sector in the long term.

I belong to a group of stakeholders that will always be pushing to bring forward more innovations, but we also need to understand that OEMs’ customers need to integrate gradually. The European Commission understands this and is therefore similarly working to push innovation, but also to listen to the associations of OEMs. While each stakeholder has a role to play, the final word comes from the policy makers and so is in the hands of the European Commission.

It is necessary to have seamless data transfer from the car, from train station platforms and from other areas, which will alert users to delays or to a lack of available parking spaces in a given area, meaning that they will avoid a wasted journey to that part of the city



Do you feel that the European Commission’s approach is not overly top-down?

At the moment there is a clear push from the commission with regard to societal deliverables; we understand that and we understand its importance. However, it is important that the EU does not forget about the technology virtue that our stakeholders bring to the table.

R&D in the transport sector is, of course, crucial. What then do you think needs to be done to ensure Europe maintains a global leadership position?

Clearly, Europe still maintains a leadership position in some technology areas, but we are now having to increasingly compete with Japan, the USA and also with China in some areas. While this often tends to be the work of global companies, which take the best of each of the regions in which they work, there is still a need for Europe to sustain the work that has already begun – and which is being boosted by the work of the commission – in the universities, the labs and the SMEs that are bringing forward disruption in innovation, which goes on to be processed in the bigger companies.

The financial assistance being lent to this sector needs to continue; indeed, there is a need for this to perhaps be increased. In the USA, for example, there is much more venture capitalism than we see in Europe, and this highlights a particular issue: in Europe, there is not enough belief in the democratic participation of capitalism. European citizens are not proud to invest in their own capabilities and are more averse to taking risks. At a time when there is a lot of criticism of the banking sector and their role in and actions during the financial crisis, there is a distinct lack of what may be termed ‘innovative capitalism’ in Europe today. In the US this appetite is there. In Japan there is a government which, despite a lack of means, continues to overinvest, and the international financial system continues to provide them with loans because Japan is a country where people have a very strong work ethic and where the products and services they provide are often world class; the financial markets believe the Japanese will deliver.

There is also a question of culture and of the harmonisation of education systems, and while

many of the unnecessary hurdles have been removed, issues remain that are preventing the delivery of innovation. There are currently some unnecessarily bureaucratic and non-practical visions of where the market is going *versus* what we need; we must recruit from India, Asia and Africa, but at the same time there is a surplus in some areas of expertise. In light of this, the need to harmonise the market and simplify the connections between diplomas and countries is clear, as this will enable the mobility of professionals across borders. The current situation is unacceptable; we will soon be celebrating the 60th anniversary of the Treaty of Rome, and yet we are still not able to harmonise diplomas.

How can industry become better integrated into activities, and what are your thoughts on initiatives such as the EGVI etc.?

This is extremely important. I have been part of the management committee of the European Green Vehicles Initiative PPP from the beginning. This initiative was authorised first of all by DG Growth, and has come to involve DG Move and DG Research, which are now the policy stakeholders that are actually running it. EGVI was launched at a time when budgets were shrinking as the financial crisis took hold, and it is initiatives such as this which are the right approach to boost precompetitive collaborative research projects to enhance electrification.

We are looking at the many diverse fields here – from battery enhancement, components around electrification, hybridisation, even improvements to the internal combustion engine – with a very clear approach that combines all the stakeholders, the infrastructure and so on with one clearly defined set of goals: to secure jobs, advance research and create breakthroughs.

This PPP has demonstrated the agility of the sector, as well as the importance of transparency, in that the process selection with the commission is very clear, with the commission intervening at each stage so that there are no surprises with regard to how the financing is working.

We now have 85 members, which illustrates the PPP's level of success, and we are now thinking of how the initiative will continue beyond Horizon 2020.



The concept of intermodality has an increased emphasis on work across boundaries towards an environment where data is shared and transferred from one mode to another

How will ERTRAC continue to promote and support R&D activities in road transport moving forwards?

We are an advisory platform which advises the European Commission of the content of the calls. This is extremely important and we work to provide an up-to-date strategic research agenda. I personally launched the first taskforce on automation, which has now been transformed into a fully working group.

We are currently working on renewing the roadmaps – the last version was released in 2011 – with regard to electrification, improving hybridisation, safety and heavy duty vehicles. These strategic roadmaps must be constantly renewed, and once we have shared them within our multi-stakeholder approach they become the roadmap that is the most valid.

We would also like to become more involved in the link between academia and research institutes and business models with the market. This is something we are already active in, and we are quite good at it because we bring lots of researchers together in different projects. ERTRAC complements the European research arena well and is bringing vivid, concrete research projects to life – these projects are also open to non-members.

In the last seven or eight years, the platform has truly consolidated its position with the commission, with member states, and with other public sector actors, and we remain committed to our vision for road transport research in Europe.

Jean-Luc di Paola Galloni
Co-Chairman
European Road Transport Research Advisory Council (ERTRAC)

<http://www.ertrac.org/>

Technology transition

The development of technologies that support short-term climate change mitigation in the transport sector is vital in the transition to a low carbon economy

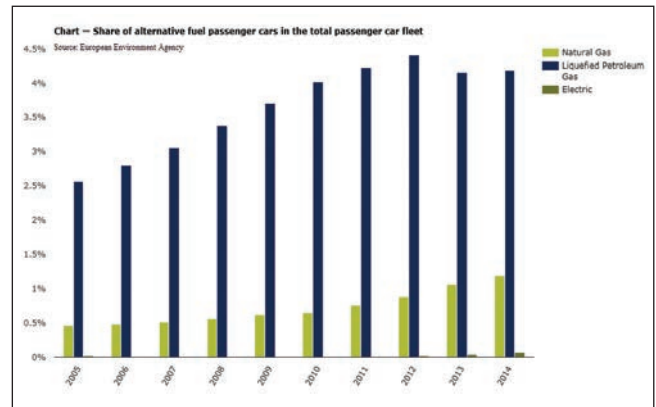
Concawe is a research association which focuses the tremendous technical expertise available within the European petroleum refining industry to improve the scientific understanding of environmental, health, safety and economic performance aspects of petroleum refining and the distribution and sustainable use of refined products.

During her opening speech at the Transport Research Arena (TRA), held in Warsaw from 18-21 April 2016, Violeta Bulc, European transport commissioner, posed a number of questions, including: “Why do we need innovation?”

This article picks up on Commissioner Bulc’s question in relation to the issues of climate change and urban air quality and gives an insight into research conducted by Concawe to understand these issues, and to consider opportunities for short-term mitigation which are vital in the transition to a low carbon future.

Climate change

The 2°C limit agreed at the Paris COP21 meeting (2015) is, without doubt, a major challenge for society as a whole and the oil refining industry in particular. The contribution of transport emissions to climate change is clear, and many of the innovations presented during TRA 2016 aim to reduce these emissions. I am truly inspired after learning about the myriad of ideas under development at the TRA. Progress with the development of truly innovative e-mobility, including ‘special vehicles’ such as e-bikes and autonomous electric public transport, is impressive, and it is



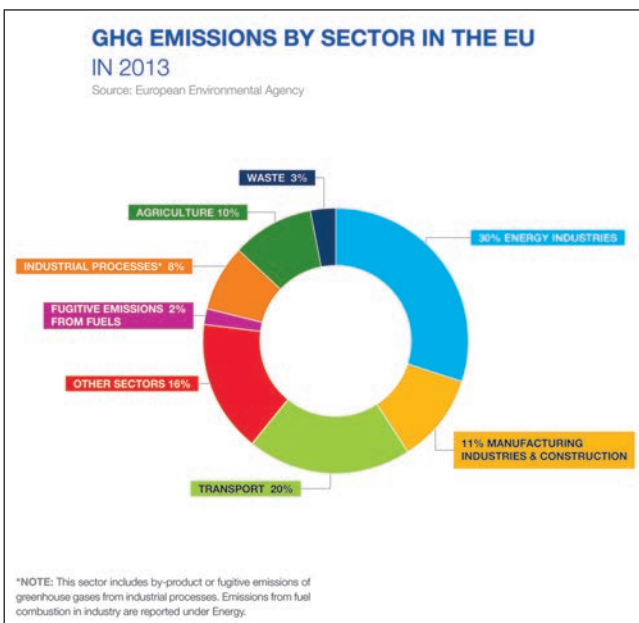
easy to conclude that we are in an era of major change. One of the most newsworthy developments, given the attention it generates, is the progress with the electric car, as many electric cars appear to offer the solution to both the climate change and urban air quality challenges. But is it really as straightforward as many would like?

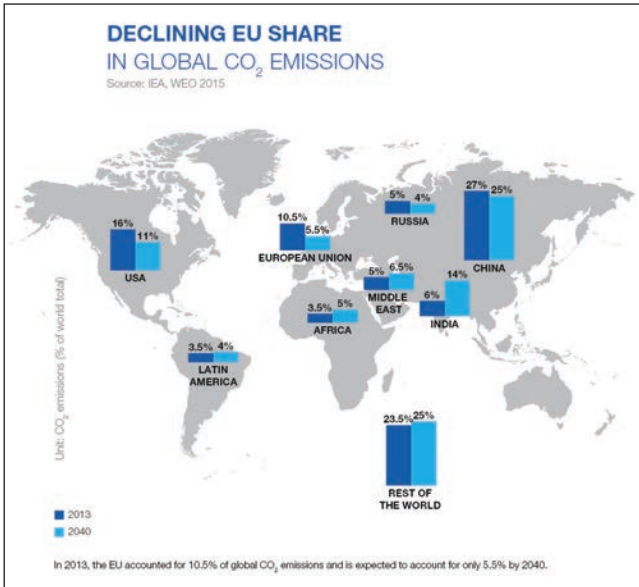
In 2015, electric cars made up less than 1% of new car sales. Projections from the car manufacturers present at TRA 2016 forecast that by 2030, electric cars will still only be a minor part of the transport fleet. (Source: European Environment Agency.)

This is consistent with information available to Concawe as part of the JEC consortium (Joint Research Centre of the commission, EUCAR and Concawe) and used as input to the ‘fleet and fuels’ model. It is therefore unlikely that electric vehicles will have a significant impact on the reduction of carbon dioxide (CO₂) emissions until at least 2040.

In the meantime, innovation is needed to ensure that, on a lifecycle basis, electric vehicles do eventually contribute to a real reduction in CO₂ emissions. Innovation is also necessary to make the cars more affordable for a greater percentage of the population. We need advances in technology 1) to reduce the overall emissions generated in manufacturing the battery, and 2) to extend the utility of the batteries. In parallel, continued investment is needed to shift the electricity supply in favour of renewables and to develop the infrastructure that is needed to charge electric vehicles in an optimal way.

The time required for sufficient penetration of electric vehicles with a real CO₂ saving, using a renewable weighted electricity supply, is inconsistent with staying below the 2°C limit. It is imperative to support innovation that will have an impact in the





shorter term as part of the transition to a lower carbon economy in the longer term.

The ERTRAC roadmap for ‘Future Light and Heavy Duty ICE Powertrain Technologies’ highlights the need for continued investment to improve the efficiency of the internal combustion engine and to develop the next generation of hybrid drivetrains. The petroleum refining industry will play its part in implementing this roadmap via the development of new fuels and lubricants optimised for the new engines and hybrid drivetrains.

Whilst such innovations will contribute, the scale of the problem is such that we need to take a broader view. Serious questions have been raised as to whether first generation biofuels result in any CO₂ emissions savings compared with the petroleum-based fuels (often called fossil fuels). The development of advanced biofuels should continue for the longer term, but it is not very likely that these will be available on a sufficient scale to change the short-term climate change trajectory.

We would welcome a reassessment as to whether biomass should be considered as a CO₂ sink rather than an energy source. There is evidence that slowing down deforestation and promoting reforestation (replanting felled forest) or even afforestation (planting new forest), in Europe and in other regions, would sequester far more carbon over the next 30 years than would be saved with first generation biofuels.

Carbon capture and storage can provide opportunities to offset CO₂ emissions with short and long-term climate benefits. As yet there are not enough operational CCS sites. The encouragement of innovation to develop CCS technologies will be vital as a contribution to the CO₂ reduction targets.

At Concawe we are about to publish a study on the impact of the International Maritime Organization regulation on sulphur (S) in marine fuels. Concawe’s estimates show that, to meet the IMO standard, refineries will have to operate at a higher severity to increase the yield of lower S distillate and to convert high S-heavy fuel oils. In the event that all ships relied 100% on new lower S

marine diesel, CO₂ emissions from EU refineries would increase by 17 million tonnes per year. On the other hand, if all ships were to fit scrubbers, the additional CO₂ emissions would be nine million tonnes per year. In practice, market forces are likely to result in a combination of both solutions, so the specification is likely to result in additional CO₂ emissions of between nine (scrubbers only) and 17 million (marine diesel only) tonnes within the EU.

In comparison with global CO₂ emissions currently, at 35.9 million gigatonnes of CO₂ a year (2014; source JRC Edgar database), the extra CO₂ appears to be a ‘drop in the ocean’, but at a time when the world is struggling to stay within a 2°C limit, it is important to consider every contribution.

Furthermore, there are a number of studies in the literature that suggest SO₂ in the atmosphere has a climate cooling effect. Concawe has commissioned further research so that we can better understand this effect.

Urban air quality

Later this year, Concawe will publish a study which models the progressive reductions in particulate matter (PM) and nitrogen oxide (NO_x) emissions in the EU and their impact on urban air quality over the 2015-2030 period as a result of the increasing permeation of vehicles that are fully compliant with successive emissions regulations.

The exhaust systems on modern (Euro 3 onwards) vehicles effectively reduce particulate matter (PM₁₀ and PM_{2.5}) emissions to the extent that, as such vehicles permeate the European vehicle fleet, PM from vehicle exhausts will be a diminishingly small contributor to overall PM emissions. The study shows that, after 2020, PM emissions from transport will come primarily from non-exhaust sources.

The study shows that as vehicles which fully meet EURO 5 or EURO 6 requirements permeate the vehicle fleet, more urban areas will meet the air quality standards. However, several cities are likely to have high NO_x ‘hotspots’. Additional, specific local measures may be required to ensure these remaining areas meet the standard.

To reduce the ‘environmental footprint’ from the refining of oil and the use of petroleum products, Concawe is conducting research aimed at developing the understanding needed to inform the industry, regulators and other stakeholders alike.



Robin Nelson
Concawe

+32 25669100

robin.nelson@concawe.org
www.concawe.org

Tailormade mobility

Urban mobility is facing unprecedented challenges: the Laboratory of Transport Research for Innovation and Sustainability (TRIS) at the Politecnico di Torino presents its interdisciplinary applied research approach

Sharing economy, mobility as a service, innovative applications of ICT, etc. are all in rapid development and demonstrate that a transition is occurring in the transport sector. This transition is the response of a system facing two major limits: the availability of conventional crude oil has ceased to grow; and the external costs of massive usage of combustion engines have become excessively unsustainable. The need for transport systems to perform better with fewer available resources is a necessity.

At the TRIS laboratory, we think that interdisciplinary applied research is needed to address today's solutions to problems that cannot wait for tomorrow's technology anymore. Our research enlarges the knowledge of human behaviour in a space-time environment and develops concrete solutions to help individuals, firms and decision makers forging a smarter sustainable mobility of goods and people, adapted to the specific geographical context.

The TRIS laboratory is part of the Interuniversity Department of Regional and Urban Studies and Planning (DIST), a joint department of the Politecnico di Torino and the Università di Torino whose main objective is to promote research regarding the physical, economic, social, political, and cultural transformation and development of the territory, from the local to the global scale. The department has been ranked number one in Italy by the National Agency for the Evaluation of Universities and Research Institutes (ANVUR).

Innovation on two fronts

Over the years, the international research team that forms the Laboratory of Transport Research for Innovation and Sustainability has acquired a menagerie of competencies, ranging from expertise in noise monitoring to the design and evaluation of ICT applications for transport. By combining backgrounds in civil and environmental engineering, economics, architecture and urban planning, our team, led by Professor Cristina Pronello, who is globally recognised for her active involvement on national and international research programmes, academies and associations (COST, JPI Urban Europe, TRB, ECTRI, etc.) or publications offices (ETRR, Transport, Transport and Telecommunication Journal, OTJ), is able to deal with a large array of methodologies (impact assessment, modelling techniques, spatial analysis, qualitative and quantitative data analysis, etc.) that are tailored for efficient project management and necessary for groundbreaking applied solutions in a rapidly-changing area of research.

But, because comparative advantages now tend to emerge from radical changes in business model perspectives, private companies also need to address their experiences and qualification requirements towards their future employees. This is

why we offer special opportunities to MSc and PhD students coming from engineering and architecture to follow dedicated courses developed in close collaboration with recognised professionals from Europe's largest transport industries.

Interdisciplinary and applied research

By its very essence, transport research is interdisciplinary: its object of study is naturally influenced by geographical constraints, political agendas, social organisation and cultural practices. As such, it must be studied from different perspectives in order to capture the structure and the dynamics of the system at play. Our research is based on developments coming from classical economics, urbanism, geography, architecture, marketing, social and environmental psychology, encompassing, at the individual level, the complex nature of decision making and travel patterns and, at the level of urban organisations, the endogenous factors of travel demand and trip flow equilibrium.

Our research activity is focused on two main topics: the environmental impacts of transport systems, and the analysis of travel behaviour in order to define proper policies of sustainable mobility. The research themes on which we work are:

- Transport planning and transport economics;
- Travel surveys, mobility management, travel behaviour and pricing policies;
- Environmental evaluation of transport systems: methodology, models, monitoring and measurement of noise and vibrations;
- Social costs of transport; and
- Assessment methodologies: cost-benefit and multi-criteria analysis.

Recent projects: local anchoring and global co-operation

Our aim as an applied research team is to develop and adapt any realistic solution that will improve the mobility and the trip quality of European citizens as well as the efficiency and security of urban freight deliveries. To this end, we have been involved in numerous projects with various end-product typology: infomobility (real-time multimodal navigator), network design, the development of infrastructures and services adapted to the elderly and people with reduced mobility, virtual and physical platforms for freight operators, etc. Our close relationship with stakeholders and policy makers from our immediate environment (western Alpine border, France/Italy) as well as our renewed collaborations with multinational actors (universities and research centres such as Chalmers, UPM, TU Dresden, Fraunhofer, DLR, IFSTAR, TRL, etc. as well as industries such as Thales, TNT, Arriva



Group, etc.) illustrate the reliance on our expertise. Amongst the most illustrative projects we have participated in, we can cite:

- **OPTICITIES** (www.opticities.com): Optimize Citizens Mobility and Freight Management in Urban Transport. Financed under the European Commission's Seventh Framework Programme, the project aims to develop and test interoperable information transport system solutions in six different cities (Birmingham (UK), Gothenburg (Sweden), Lyon (France), Madrid (Spain), Turin (Italy) and Wrocław (Poland)) in order to provide urban citizens with the best possible journey conditions and to optimise urban logistics operations;
- **SMART-WAY** (<http://www.gsa.europa.eu/galileo-based-navigation-public-transport-systems-passenger-interaction>) project for the development of Galileo-based navigation in public transport systems with passenger interaction;
- **ALPINFONET** (<http://www.alpinfonet.eu>): a cross-border co-operative project (Austria, France, Germany, Italy and Slovenia) whose aim was to develop a sustainable mobility information network for the alpine space;
- The re-organisation of the public transport network of the Turin metropolitan area: transport supply adapted to the demand, rationalisation and differential timing organisation;
- **URBeLOG** (URBan Electronic LOGistics), a project whose target was to realise and validate a virtuous freight transport system that makes more rational, cost-effective, efficient and environmentally-sustainable 'last-mile' distribution services;
- The analysis of potential users of public transport inside rural catchment area for a local operator (Sadem, Arriva Group); and

- **SKILLFUL**, a Horizon 2020 project to identify the skills and competences needed by the transport workforce of the future (2020, 2030 and 2050) and define the training methods and tools to meet them.

Various papers published in peer-reviewed scientific journals, as well as internal deliverables, are all publicly available and present the results obtained from concluded projects.

Exciting applied research with social impacts is what our interdisciplinary experienced team at the Laboratory of Transport Research for Innovation and Sustainability is looking for. Mobility services, dedicated to both passengers and freight, have become critical to maintaining the reliability and to boost the resilience capacity of our modern societies. Inside a highly competitive research area, with hot and sensitive topics to deal with, it is important to co-operate with attractive and competent partners you can trust.



Cristina Pronello
Professor
Politecnico di Torino
+39 011 5645613
cristina.pronello@polito.it
<http://www.polito.it/ateneo/dipartimenti/dist/?lang=en>

As director general for transport at the Austrian Ministry for Transport, Innovation and Technology, Ursula Zechner outlined her country's progress at TRA 2016

Austrian action

Ursula Zechner, director general for transport at the Austrian Ministry for Transport, Innovation and Technology, used her speech at the sixth European Transport Research Conference, which Pan European Networks attended in Warsaw, Poland, to outline some of Austria's priorities in the transport sector.

She began by highlighting how the theme of the event – 'innovative solutions for tomorrow's mobility' – ties in closely with Austrian strategies in the field of transport: "We are now approaching a window of opportunity to adapt the current existing transport and mobility systems towards future needs.

"In this age of movement, Austria is in the unique position to have one ministry dealing with the main fields of the conference – research, development, and deployment," and this, the DG added, "is embedded in the common policy framework covering technology, organisational or governance aspects."

Societal challenges

The Austrian traffic plan was published in 2012, and it was here that the country set out its policy goals with regard to safety, efficiency and environmental impact – areas which are, of course, being focused on throughout Europe. Going beyond this, however, Zechner explained how the country is also exploring the social aspects: "We are taking account of and are focusing on affordability, accessibility, quality and a barrier-free mobility system."

Regarding the latter of these areas, she explained that transport technologies, including intelligent transport services, have challenges ahead. "The Austrian ITS action plan," she continued, is therefore "focused on mobility for all in harmony with the environment and society. An intelligent transport system provides organisational and technical support to connect all modes of transport, with the aim of providing users with accurate information and decision support in real time.

"By pursuing these goals, Austria continues its path from being an innovation follower, to an innovation leader. Based on that vision, different measures have been taken, especially where both the private and public sectors are working closely together."

Projects

The director general went on to provide her audience with examples of Austrian projects in these areas. She began by discussing the passing of a common agreement between different public sector actors to set up a common multimodal transport graph, which also acts as a common

geographic reference system. This is the graph integration platform (GIP) which Zechner explained as a basic reference tool for transport services in Austria and, moreover, that a common multimodal traveller information service has now been developed based on the GIP.

She continued: "This project was realised by a co-operation between infrastructure operators with the Austrian Transport Association, the Austrian touring club and the ministry. By the end of last year, this traveller information system became fully operational and also formed an independent company." This business has been established so as to ensure a discrimination-free traveller information service for different channels for all users, something which had been previously highlighted at the TRA 2016 conference by the European transport commissioner, Violeta Bulc.


Across borders

While this multimodal information system is now in place in Austria, the fact that cross-border journeys can be taken quickly and with relative ease means that it is now more important than ever for travellers to have cross-border information services. As such Austria is now working with the Czech Republic, Slovakia, Hungary, Slovenia and Italy in different projects to link different systems in order to provide the necessary information across borders. As an example, the DG highlighted how the Austrian Motorway and Expressway Network Operator (ASFINAG) is working with the Czech Republic to provide cross-border traffic information for users of the road network. Zechner elaborated: "This is both an EU project and a TEN-T project called 'Crocodile'; it is organised by our national agency Austria Tech, and we try to harmonise the different data standards so we have one link between the different information so that travellers can receive important information for their onward journey when they reach the border.

"Another core feature," she continued, "is automated driving, and the Austrian Ministry of Transport, Innovation and Technology is currently developing an action plan which links all the different stakeholders so as to have a clear view on all the important items."

From the points raised by Zechner, it is possible to hold Austria as something of a benchmark for progress in these areas and, with the 2018 instalment of the European Transport Research Conference being held in the country, it will be interesting to see how it continues to develop.





Alberto Peña Rodríguez and Iñaki Eguia Ibarzabal of Tecnalia discuss the multiple complexities in reducing the weight of vehicles and Spain's R&D targets for this automotive industry concept

Lightening the load

With energy and environment high on the European Commission's agenda following the 2015 Paris Climate Conference, the pressure is on the automotive industry to produce cars and use manufacturing processes that will adhere to the EU's tough CO₂ emission reduction targets set for 2020. The automotive industry has been driven to develop new materials at a fast pace in order to produce lighter cars that create fewer emissions whilst also responding to a consumer need for greener cars.

Reducing the weight of conventional, internal combustion engine-powered cars has been the subject of research, technology and development for decades. It has become clear that no single material category offers the optimal performance throughout the vehicle. Consequently, the global car industry is working towards a multi-material future of growing complexity, especially in regards to highly local material characteristics, tailored differently to different zones, and in terms of joining together a range of materials.

Growing market

Automotive lightweighting goals are driven by several current factors. Changes in government fuel economy and emissions regulations result in reducing the structural weight of the vehicle and are one of the most important ways of cutting fuel consumption; a 10% reduction in vehicle mass yields an approximate 6-8% increase in fuel economy.

Meanwhile, rising and fluctuating fuel prices have an impact, as does an ever-growing concern regarding global warming. Furthermore, the development of electric and other fuel systems development has an impact, as every kilogram of vehicle weight saved conserves batteries and fuel, providing greater overall energy efficiency and operating range. Yet the continual addition of features on cars can quickly lead to a spiralling increase in weight.

The global market value for lightweight materials used in the transportation industry will reach nearly USD 153bn (~€135bn) in 2017, up from an estimated \$106bn in 2011, with a five-year compound annual growth rate of 7.5% according to the 'Lightweight Materials in Transportation' report published in 2013. Transport original equipment manufacturers (OEMs) and suppliers want to achieve vehicle lightweight goals without a loss of performance or aesthetics.

Getting a substitute

Vehicle weight reduction can be achieved by a combination of material substitution, the optimisation of component design/system layout and innovation in manufacturing processes. Furthermore, material developments for lightweighting purposely gravitate around the following group of materials: steel, aluminium, carbon fibre, plastics and composites.

Consumer preferences have limited the downsizing options available to automakers, and safety and performance standards have resulted in a very limited ability to reduce weight further with conventional materials. Material substitution – replacing heavier iron and steel with weight-saving advanced composites and other plastics, aluminium, magnesium and advanced high strength steel – is essential for boosting the fuel economy.

Furthermore, material substitution is dependent on mechanical properties, cost, design and manufacturing capabilities. In addition to reduced fuel consumption, weight reduction enables smaller power plant and energy storage systems with corresponding cost and/or performance benefits, as well as secondary weight reductions in load-bearing structures.

The right material

Material selection is impacted by assembly methods, formability, paint technologies and corrosion protection requirements, as well as the general acceptance by OEMs of performance correlations for alternate materials. Weight reducing material selection is also impacted by material availability in quantities required for series volume production, cost per unit of weight saved, and material weight-saving potential per vehicle produced. The drive for lightweight results in materials technology is increasingly being considered as part of the initial design.

Concerning steel, the trend towards saving resources and lightweight design is still the dominant motivation for the majority of development projects in industry, as well as in research in Spain. Future sheet metal components are designed to have higher stiffness and toughness properties and reduced weight at the same time. Besides lightweight topics, the trend in industry tends to be towards a higher accuracy and complexity of the geometric requirements of sheet metal parts.

Therefore, research concentrates on processes and tool development to improve added value of sheet metal parts.

In order to achieve these goals, two following major research strategies are addressed: 'lightweight and stiff' – components made of lightweight materials with high stiffness, and 'thin walled and high strength' – components made of thin and high strength materials.

The other trend of increasingly using high strength materials with reduced thicknesses is represented by the development of advanced high strength and ultra high strength steels such as DP1000, CP1000 or TWIP materials. Both composite and high strength materials pose various questions concerning material characterisation and modelling, tribological issues, tool making and forming processes, and new dimensions in terms of quality assurance.

Regarding plastics and their composites, as well as lighter metals, they are increasingly being used to reduce vehicle weight. In contrast to thermoset composites, thermoplastic composites offer advantages in terms of weight reduction, reduced costs and recyclability.

During recent years in industry, various new materials were developed and introduced into the market. Today's examples for 'lightweight and stiff' materials are composites (sandwich) or fibre reinforced materials which offer promising material properties, but, unfortunately, manufacturing these hybrid materials is too expensive up to the present day.

Car bumper: materials such as carbon fibre are being used to reduce the weight of vehicles

Green framework

Even though many of the materials, designs and structures used in internal combustion engine (ICE) vehicles can also be applied to fully





According to Tecniaia, Spain has specific priorities regarding automotive lightweighting R&D

Spanish priorities

There are several areas which constitute the main priorities for the Spanish automotive sector in lightweighting. The first is the development and manufacture of lighter, high performance materials. Within this realm, there are several target areas, namely analysing the lifecycle and ensuring environmental sustainability. This constitutes recycling, reusing and revalorisation of materials at the end of a product's useful lifecycle, for example batteries and electric motors, along with the development of renewable and alternative materials in order to replace non-renewable ones, e.g. biomaterials.

Other factors are the design and modelling of vehicle modular architecture, high energy absorption properties to improve vehicle safety without penalising weight, and lightening and optimising batteries and electric motors, thereby reducing costs whilst increasing motor specific power and improving mechanical performance. Furthermore, new, multifunctional performance materials and components for new vehicles are an area of interest, for example, sensors and actuators.

In addition to the development and manufacture of materials, other target areas in Spain are improving the implementation of nanotechnologies, i.e. nanocomposites, polymeric matrices, etc. and the development and implementation of electronic systems embedded in materials in order to inform their behaviour in real time.

Another area of interest is the development of multifunctional materials to allow their implementation in the surface of vehicles and in key vehicle elements. Finally, there is the priority of developing new joining technologies with lower environmental costs, paying special attention to dissimilar joining, and enabling easier dismantling and recycling processes.

electric vehicles, key differences exist between both types of vehicles which have their impact on the optimal approach to minimising weight, whilst also pursuing other key performance targets with regard to cost, manufacturability, crashworthiness, and static/dynamic structural behaviour and integrity.

As the design constraints are also radically different, next generation fully electric vehicles will offer new types of architectures with different weight distributions. In particular, the key components, for example, electric motors and battery packs, can be in different locations with respect to ICE-powered and hybrid vehicles, i.e. front engine plus gas tank in ICE *versus* one or more small electric motors plus a possibly distributed battery pack in EVs.

Hybrid and EV components from the first generation are mostly derived from industrial equipment, such as drives, static energy storage systems, etc. These components need to be re-engineered in order to meet the stringent requirements of the road transportation sector in terms of cost, reliability, weight, volume and safety. This means that new materials and processes must come into play, particularly when it comes to mass production of electric components under automotive sector requirements.

Technological solutions from other fields, such as power electronics, renewable energies and nanotechnologies (strong research fields in Spain), may offer significant improvements to the new generation of hybrid and EV components.

Alberto Peña Rodríguez
Iñaki Eguía Ibarzabal
Tecniaia

www.tecnalia.com

Green wheels on the move

Amidst concern over the environment, Alcoa Wheel Products Europe has been urging the adoption of aluminium over steel wheels for social and environmental benefits, as detailed below

WE cannot avoid the increasing pressure upon us to become greener when it comes to public transport. During the 2015 United Nations Climate Change Conference (COP21), which was held in Paris last December, a global agreement on the reduction of climate change was negotiated and afterwards signed by 174 countries. More and more city populations realise that they breathe in filthy air and refuse to accept it any longer. The facts are there and straightforward. According to the European Environment Agency (EEA), the small European country of Belgium suffered 11,770 premature deaths in 2012, attributable to fine particulate matter (PM2.5), ozone (O₃) and nitrogen dioxide (NO₂) exposure. For other countries, the numbers look just as stark: the UK – 52,530 deaths, France – 52,600 deaths, Germany – 72,000 deaths and in Italy there were a staggering 84,400 deaths.

City leaders

City populations see the need for achieving zero emissions (ZE) and feel the sense of urgency. The pressure on national governments to do something is rising. With the Cities Climate Leadership Group (C40) initiative, for example, mayors of major cities around the globe are joining forces to speed up and develop solutions to make their cities smarter and greener.

Sam Truyers, European public transport key fleet manager for Alcoa Wheel Products Europe, has been following the green transport topic very closely. He strongly supports the urge to act now: “The technological developments we have seen over the last decade – to mention a few: Euro 6 engines, CNG [compressed natural gas] and hybrid buses – offer undeniable progress, but are still far away from the levels of decarbonisation needed to

keep the global temperature rise below the targeted 2°C. Let's face it, time is running out and there is no room for half-baked solutions here.”

One of the key challenges, Truyers points out, is getting clean ZE public transport up and running. This means a large-scale transition with smart, economically viable and financially feasible investments in battery and fuel cell technology, in charging infrastructure and in lighter electric city buses.

Private sector solution

Being a firm working in the public sector, Alcoa Wheel Products Europe is considering the environmental challenge: “When focusing on lighter buses the key word is of course weight. Why? Well, less always stands for more. Lower vehicle weight means increased passenger capacity, higher battery autonomy, better range and reduced operating costs – all of this without compromising on strength and safety, obviously.”

The fastest way to achieve weight reduction is, Truyers argues, through using parts or materials that are already on the market, have proven their added value and offer an immediate weight saving: “No need to reinvent the wheel. At least not when a premium forged lightweight aluminium wheel is already available.”

Switching from steel to forged aluminium wheels offers a myriad of benefits. The wheels are much lighter than steel – up to 47% – contributing to a saving of up to 93kg in weight for a typical six-wheel bus and 155kg when an articulated bus with ten wheels is considered. “Because such wheels are much lighter, mounting them directly counteracts the extra weight coming from lithium batteries and Euro 6 engines.”

Truyers adds: “A lithium battery easily adds 400-500kg to the weight of the bus. Euro 6 engines are up to 125kg heavier than Euro 5 engines. All those extra kilos need to be compensated for somewhere along the line.”

Better heat dissipation and radial runout furthermore lengthen the lifetime of tyres. Aluminium wheels run upto 22°C cooler than steel wheels, reducing tyre wear and providing a longer service life. Less de-scaling, removal and replacements at their end reduce operating costs significantly.





Aluminium wheels are providing operators with a spread of benefits

Most decision makers consider this story too good to be true, yet Alcoa has carried out tests in which a wheel endures a load of 71,200kg before deforming by 5cm. Similar testing on steel wheels revealed that deformation already occurred at 13,600kg. The Japanese light wheel alloy test is another well-known test in the industry. It simulates a truck hitting a high curb at a speed of 50km/h, and a 910kg weight is dropped onto the tyre and wheel assembly. The results for the steel wheel showed excessive rim deformation and air loss.

Scottish case study

Such modern wheels also offer green benefits. They offer a cut in CO₂ emissions by up to six tonnes and save over 1% of fuel through switching from steel wheels to aluminium. Lothian Buses Limited, a UK-based bus fleet, made the shift. The company fitted aluminium wheels on a number of its hybrid buses and systematically measured and compared the performance with buses still using steel. After six to seven months, they reported a significant drop in their cost structure resulting from less time spent on maintenance and replacement of parts. They noticed that the buses using aluminium were indeed much lighter than the exact same buses using steel. In the end they testified to have been able to grasp fuel savings of over 1% on their hybrid buses.

What do these facts actually imply? Truysers explains: “Choosing forged aluminium wheels offers clear advantages – not only for city bus fleets and bus OEMs, but also for cities, municipalities, citizens and taxpayers, and of course, more importantly, the environment. With the strict targets of Paris COP21 in mind, we need to get more people involved when it comes to public transportation and we need to act fast. Aluminium wheels just happen to have a clean and beautiful look, but they are much more than just a nice asset. In fact, they help to increase the image and attractiveness of public transportation as a whole. Green is the future. Spread the word. Act now and do whatever it takes for a greener and better tomorrow.”



Alcoa Wheel Products Europe
www.alcoawheelseurope.com

FuelsEurope explores exactly what is needed to bring transport into a sustainable, efficient, environmentally friendly network

A fundamental service

Transport performs a fundamental service to society, offering the ability to move goods, people and services. Affordable mobility is a key contributor to the quality of life of European citizens and is intrinsically linked to economic growth. The transport sector is unarguably an important contributor to greenhouse gas (GHG) emissions. One has nevertheless to recognise that all transport fuels and energy will produce greenhouse gases to a varying extent based on the emissions generated during their entire lifecycle.

Reducing GHG emissions

In the EU, however, whilst getting 93% of its fuel from oil refined products, road transport emissions are on a reducing trend as a consequence of continued vehicle efficiency achieving significant improvements, including through contributions of high performance petroleum-derived fuels and lubricants. Further improvements in these technologies, in addition to vehicle fleet renewal and smarter mobility behaviour, will deliver further reductions in GHG emissions.

Beyond these continued efficiency measures, further reducing the GHG intensity of transport will require the substitution of petroleum with biofuels, biogas, hydrogen, liquefied petroleum gas, natural gas or electrification. The latter can take many forms starting with hybridisation, e-bikes and small vehicles, but the substantial replacement of petroleum in light transport will require extensive use of large batteries. These are of particular concern with regards to the high costs of GHG reduction and the necessary infrastructure.

Addressing air quality

The future, more sustainable transport policy/system will also have to ensure that beyond the reduction of GHG emissions, the air pollution resulting from the sector is being addressed. There have been many changes in fuels and vehicle regulation and many other measures in the last ten years targeting air pollution, and there have been significant improvements in European air quality. However, non-compliance with the Ambient Air Quality Directive persists in several areas, in terms of specific ambient air quality limit values being breached in many cities. In some cases this is just a few occurrences a year, but in others it may be a regular weekly or even daily occurrence.

For two key pollutants – particulate matter (PM) and nitrogen oxides (NO_x) – road transport, and diesel vehicles in particular, is among the most significant sources. Road transport is therefore targeted for emission reductions, and it is of the utmost importance to understand its contribution in depth in order to understand the possible outcomes from measures under consideration.

The implementation of Euro Standards, in particular Euro 4, 5 and 6, has dramatically reduced PM levels from diesel vehicles. These reductions have been seen in both the official certification tests and real on-the-road emissions.

By 2020, the contribution of PM emissions from road transport to total primary PM emissions will be small and the major part of it will consist of non-exhaust emissions from tyres, brake wear and road abrasion. By 2030 the PM emissions from road transport will become essentially these non-exhaust emission sources, and therefore ambient levels of PM will be independent of the vehicle powertrains.¹

On the contrary, we have to recognise that the implementation of Euro Standards, up to and including Euro 5, has not been as successful at reducing NO_x as it has at reducing PM. Whilst reductions have been seen in the official certification tests, these reductions have not been seen in real on-the-road emissions. However, the recently implemented Euro 6 standard will make significant reductions in NO_x emissions. In addition, the introduction of 'real driving emissions' (RDE) measures, to check that emissions performance on the road is in line with that demonstrated in official laboratory emission certification tests and the transition to the new Worldwide Harmonized Light Vehicles Test Procedure (WLTP) drive cycle, should address the remaining concerns that some vehicles have higher emissions in real in-use conditions.

The Concawe study anticipates that the number of non or uncertain compliance zones, and therefore the population living in them, will continue to decline between 2015 and 2030 on the assumption that there is a rapid and full adoption of RDE Euro 6. By 2030 the remaining areas of concern will look like discrete islands of non-compliance, which will require the implementation of targeted, specific solutions rather than sweeping or wide-ranging measures.

This relative cleanliness of Euro 6 diesel vehicles is often overlooked by those promoting electrification on air quality grounds. We should also consider the fact that transitioning all of urban transport to electrification would be very expensive and slow, due to the need for extensive grid and charging infrastructure, and the demands of transitioning to vehicles with different capabilities, whereas transitioning to

Euro standard	Introduction dates		Petrol		Diesel		Petrol & Diesel
	New approvals	All new registrations	NOx (g/km)	Mass of particles (g/km)	NOx (g/km)	Mass of particles (g/km)	
Euro 1	1 July 1992	31 December 1992	0.97 ⁽¹⁾	-	0.97 ⁽²⁾	0.14	-
Euro 2	1 January 1996	1 January 1997	0.5 ⁽¹⁾	-	0.9 ⁽²⁾	0.1	-
Euro 3	1 January 2000	1 January 2001	0.15	-	0.5	0.05	-
Euro 4	1 January 2005	1 January 2006	0.08	-	0.25	0.025	-
Euro 5	1 September 2009	1 January 2011	0.06	0.0045 ⁽³⁾	0.18	0.0045	6 × 10 ¹¹ (4)
Euro 6	1 September 2014	1 September 2015	0.06	0.0045 ⁽³⁾	0.08	0.0045	6 × 10 ¹¹ (4) (5)

⁽¹⁾ Expressed as HC+NOx.
⁽²⁾ Applicable to direct injection petrol engines.
⁽³⁾ Applicable to diesel engines only.
⁽⁴⁾ Limit of 6 × 10¹¹ in the case of direct injection petrol engines.
⁽⁵⁾ Common limit of 6 × 10¹¹ for direct injection petrol engines and diesel engines from September 2012/September 2018.

a fleet of EURO 6 vehicles would likely cost less and be achieved earlier, potentially giving earlier urban air quality benefits.

Source: ACEA

In this context what is needed to deliver a sustainable, competitive and low carbon transport system?

The EU's transport policy should be holistic and include – in addition to low carbon fuels and vehicles – traffic demand, infrastructure improvements, and driver education, training and behaviour.² Such measures can play an important role in meeting air quality and GHG reduction targets in the transport sector at a comparatively low cost.

Over the long term, transport policy for fuels and vehicles should take an integrated approach involving all actors (vehicle manufacturers, fuel providers, infrastructures and consumers) in the transport sector. Those policies should be cost effective, technology neutral (as recommended in the council conclusions), and predictable to ensure safeguarding of the internal market.

A cost-effective decarbonisation of the transport sector requires an economy-wide or cross-sectorial approach which will deliver value for the planet at the lowest cost for citizens. The current regulatory approach is sectoral, resulting in some much higher cost solutions for decarbonisation in transport compared to other sectors due to the technological immaturity of alternatives.

Nevertheless, if such a move to an economy-wide or cross-sectorial approach with a uniform carbon price is not considered realistic in the short term, then a regulatory transition should be considered, leading to the eventual convergence of the cost of decarbonisation in transport with other sectors. In this spirit, during the transition the sectorial approach in transport in the short and medium term should include a continuation of efficiency targets on vehicles, in line with the technology neutrality principle, cost-effective and realistically set targets that are achievable through different technologies.

Moreover, an alternative compliance mechanism referenced to carbon price could be considered as a marginal compliance option for vehicle manufacturers. And, finally, the revenues from the alternative compliance mechanism may be used preferentially to support research and development and scale-up phases for new promising technologies in respect of the technology neutrality principle to support development towards cost-efficient GHG reduction routes.

Mandates are unlikely to be cost effective

We think that mandates may not be a cost-effective method for reducing GHG emissions. However, where biofuel blending mandates are enforced by member states,³ they should aim at creating consistency to maintain the single market, be only in support of biofuels that have established science-based sustainability credentials on a well-to-wheel basis, set achievable targets and keep current fuel grades to ensure vehicle compatibility.

Similarly, incentives for the development of alternative fuels and electricity should also be based on well-to-wheel assessment of the GHG emission, and should be limited in time and cost. Eventually, every technology/fuel and energy combination should compete on its own merit in a market regulated by a uniform carbon price.

We should also recognise the real carbon intensity of energy in the CO₂ regulation for cars and light commercial vehicles. Currently, for liquid fuels, the GHG reduction from mandated biofuels blending is ignored, but it should be recognised and car makers should benefit from this GHG reduction from the fuels (typically, at the current time, about 4% lower than pure petroleum fuel) in their compliance calculation. Similarly, currently the GHG intensity of electricity in this regulation is taken as zero. It should be considered instead on the basis of average EU grid GHG intensity.

Reforming the transport sector to create a low carbon and greener system is probably the biggest challenge among all decarbonisation schemes that are currently being shaped, developed and implemented in the EU. Transport has to contribute to the overall objective, but the significant advantage of liquid fuels over all known and tested alternatives, in particular in specific transport sub-sectors such as aviation, marine or heavy duty vehicles, makes it particularly challenging to achieve this transition without jeopardising the contribution of the sector to the EU economy and citizens' welfare.

References

- 1 Study conducted by Aeris Europe on behalf of Concawe to better understand the air quality compliance issues for PM and NO₂ in the EU27 countries, with a particular focus on the urban environment (published March 2016).
- 2 The refining industry has launched its Save More Than Fuel campaign, www.savemorethanfuel.eu, to reduce consumption and emissions in transport.
- 3 In support of their national agriculture and/or their national energy security and/or their contribution to CO₂ reduction.

Alain Mathuren
Communications Manager
FuelsEurope

+32 (0)2 566 91 19

alain.mathuren@fuelseurope.eu
www.fuelseurope.eu

Refining findings

FuelsEurope on how the European refining industry is a strategic asset for Europe's economy

The European refining industry plays essential roles in transport and the petrochemical industry. Refined oil products supply 90% of the energy used for transport in the EU and about two thirds of the feedstock for the petrochemical industry. These are vital components of the European economy, and a healthy domestic refining sector is therefore indispensable for European energy security in an era of geopolitical upheaval. While Europe's dwindling domestic crude oil production results in an increasing dependency on oil imports from overseas, our security of supply has been enhanced by making EU refineries flexible, reliable and capable of processing a variety of crude sources. Due to the unrivalled liquidity of crude oil in the global market of commodities, if political instability, trade sanctions or any other kind of disruptions endanger the availability of one or more crude oils, other sources are readily available to make up the shortfall.

Refined products are already supplied by refineries located outside the EU. However, increasing the dependency of the EU consumer on non-EU refineries implies a growing risk in terms of security of supply. Not all oil products have the same liquidity in the commodity markets as crude oils. Moreover, the number of suppliers capable of producing intermediate and finished oil products of the quality needed in Europe is more restricted.

In case of product supply disruptions (for political, economic or force majeure reasons), EU consumers and the EU industrial systems could face a shortage and/or a price spike. Also, the strategic implications of a secure supply of oil products for essential civil and military use (e.g. jet fuels, diesel, etc.) cannot be underestimated. A robust domestic refining industry is absolutely essential to keep Europeans and their businesses moving.

The contribution to the EU economy

Mobility is a key component of our living standards and is intrinsically linked to economic growth. Today, while renewable energy, electricity and other alternative technologies are increasingly utilised in transport, refined petroleum products are – and will remain for many years – the prominent energy source. This is due to a unique and tremendously successful combination of continuous technology advancements in the internal combustion engine and of affordable and high quality liquid fuels. The European refining industry is key in helping to make mobility more affordable for consumers and businesses.

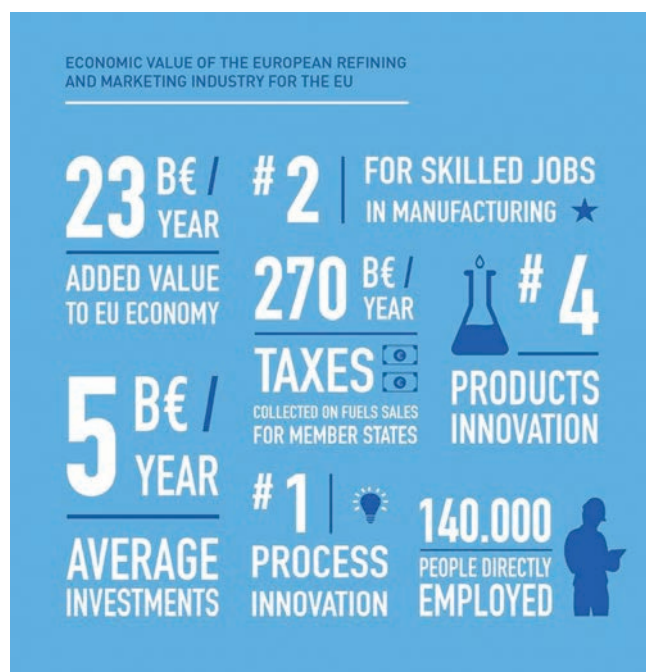
The EU refining industry also provides Europeans with jobs, many of which require professional expertise and are well paid.

Refined products represent the main feedstock for the petrochemical industry to produce petrochemical intermediates and finished products such as plastics. The high integration of refineries and steam crackers in the EU boosts the competitiveness of the petrochemical industry, which significantly contributes to the overall European GDP and provides many more jobs, beyond those of the refining industry itself. In more general terms, the integration of the refining sector in the EU industrial supply and value chain is an essential condition for the recovery of the EU economy.

A highly technological industry with a continued focus on innovation

Over the past 25 years European refiners have invested an average of €4.5bn annually towards the desulphurisation capacity of distillates and gasoline, the upgrading of production facilities and processes, the installation of emission abatement equipment, and numerous energy savings measures. Following the switch to fully unleaded gasoline, this marked the industry's full transition to the production of clean motor fuels in 2009.

The continued improvement of oil product qualities has seen the most striking results in the dramatic reduction of sulphur content



in road transport, heating and marine fuels, which has also required significant investments by EU refiners.

The EU refining industry has reduced its environmental footprint by continuously investing in the development of increasingly energy efficient technologies and processes. Moreover, the use of cogeneration and advanced catalyst systems has allowed for further energy gains. Since 1990, the refining sector has been improving its energy efficiency at an average rate of 1% per year, with EU refineries being among the most energy efficient in the world.

European refiners have further invested in new technologies in order to comply with some of the world's most stringent air and water quality (SO_x, NO_x and particulate matter emissions) and soil protection rules. This has significantly reduced their environmental footprint, cutting in half the amount of sulphur emitted by EU refineries since 1998.

The quality of water effluents has also greatly improved; over the past 30 years, refineries have decreased their oil discharge in water by tenfold.

EU refining worldwide leader in refining technology innovation

The strong capacity of the refining industry to innovate has enabled the continuous development of cleaner fuels and the setting of worldwide standards for transportation fuels.

The European Commission's Competitiveness Report (2013) recognises that the EU refining industry is at the forefront, ranked first regarding process innovation and fourth for product innovation amongst all EU manufacturing industries.

EU refining, a technology and innovation-driven industrial sector, requires a highly skilled workforce to run its activities. The Competitiveness Report ranks the EU refining industry second amongst manufacturing industries in terms of skill and knowledge intensity share of total employment.

But the pressure remains on the refining industry, and many threats loom

EU refining faces persistent competitive pressure. In the period 2008-2014 some 17 refineries shut down in the EU, adding up to an 8% capacity decline and the loss of some 10,000 direct and 40,000 indirect jobs.

This is not good for the EU economy and also detrimental to the global environment: the manufacturing of oil products in EU refineries is on average considerably less carbon intensive than in the rest of the world. The relocation of refining capacity from the EU to other regions of the world would result in a 35% increase in greenhouse gas emissions.

As the pressure is still very strong on EU refining, with more closures announced and refineries under threat in several countries, FuelsEurope emphasises the importance of undertaking a thorough and objective assessment, that looks carefully at how legislation affects costs and competitiveness, and takes in due



consideration comments from stakeholders, most notably from those directly concerned – the member states and industry.

A competitive legislative framework is an essential condition to encourage investment. While companies are used to managing certain types of uncertainty – such as changes in the market, evolutions in technology and the competitive landscape – they depend on a predictable legislative framework.

If this is lacking, it discourages investment decision makers and puts the EU at a disadvantage with respect to regions of the world where industries enjoy a stable and predictable regulatory framework.

Technology neutrality and a rational approach to the cost of carbon are also essential elements of a competitive legislative framework.

EU refiners want to continue investing in Europe but need reassuring conditions to do so. There is a clear need for predictable and non-discriminatory regulations in the EU to ensure a level playing field globally, as well as the freedom to operate under market forces.



Alain Mathuren
Communications Manager

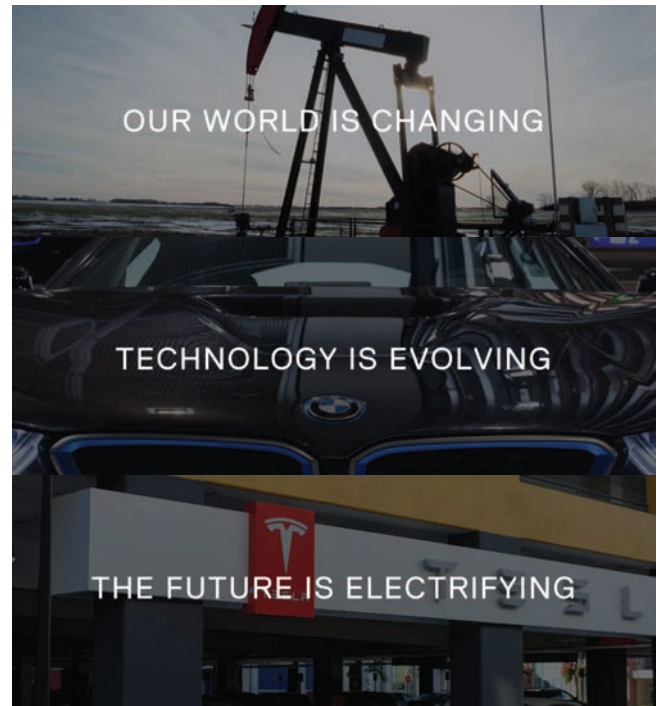
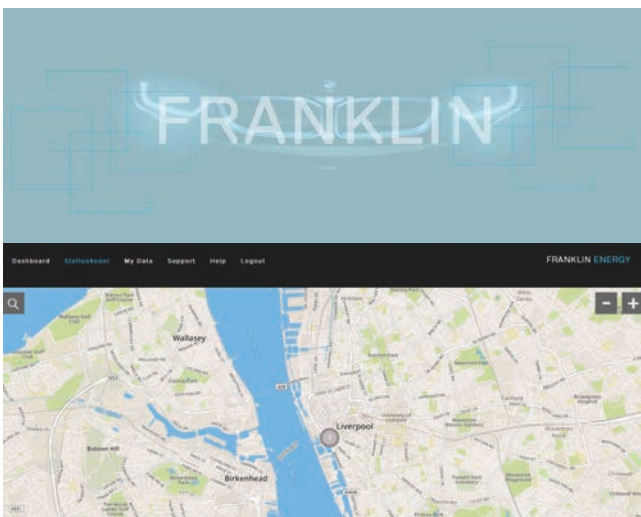
alain.mathuren@fuelseurope.eu
www.fuelseurope.eu

Fully charged

Franklin Energy provides charging and support services for the transition to the electric vehicle revolution

“WE want to be at the global forefront to the transition to electric vehicles through providing a strategic electric vehicle charging network with advanced and unrivalled back office support.” Founded in 2013, Franklin Energy is an end to end electric vehicle charging provider. As a company it provides charging solutions for residential, workplace, commercial and public charging. Franklin Energy has grown from an EV charging provider to an EV charging technology company. Based in Liverpool, UK, Franklin Energy is building a network of fast and rapid charging stations throughout England, Scotland, Ireland and Europe under its ‘LiFe’ charging network. The company also provides back office support using sophisticated cloud-based operating software. This enables Franklin Energy to monitor the network of charging points in real time. The objective is to have a network running at optimum up-time, and the LiFe charging network is currently achieving an up-time of >99%. From remote diagnostics to software and firmware updates, the Franklin Energy back office support team has the ability to remotely manage charging stations. As a company it is manufacturer agnostic, allowing it to operate over 50 different charging stations around the globe.

Some of its existing customers include Q Park UK, EDF Energy and Peel Holdings. Franklin Energy has also teamed up with other operators across Europe to provide interoperability, allowing



drivers from the continent to seamlessly charge on the LiFe network using other networks, smartphone apps or RFID cards.

Bi-autonomous electric vehicle charging

Franklin Energy founder Rob Byrne said: “The industry has really gained momentum since the Volkswagen emission scandal in September 2015. We are now seeing all major car manufacturers have a bullish approach to electric vehicles. Manufacturers are investing billions of pounds into new drivetrain architecture and battery technologies. We see this as the tipping point for the electric vehicle industry, and this will correlate to an increasing demand for charging infrastructure. We see charging forming an integral part of e-mobility and different charging solutions will be required for each user type. As we move towards autonomous vehicles becoming more mainstream, we are planning to carry out a research and development project involving bi-autonomous charging.

“This technology will have two elements. The first will be able to schedule charging for a vehicle fleet depending on location and battery status. The second will align the vehicle with the inductive charging pad and automatically start the charging using wireless



inductive power transfer. This technology will reduce the dwell time at charging stations, providing greater efficiency, and increase the utilisation of charging networks. Charging infrastructure will be ubiquitous in ten years' time, and Franklin Energy is looking to expand into Europe during 2017 and the Far East during 2018."

Franklin Energy has been supporting Transport for London, Mersey Travel and Transport for Greater Manchester, all in the UK, with charging networks for electric taxis. Here it is bidding for the framework to operate charging networks that will be built specifically for electric taxis and fleets. In 2018, new legislation will come into place stipulating that every new registered taxi

must be able to run while producing zero emissions for 30 miles. This is being enforced by Transport for London and other regional transport authorities. Franklin Energy is able to model taxi drivers' and operators' routes to assess the prime locations for charging infrastructure. This assesses the location given the accessibility, available power capacity and traffic flow.

Franklin Energy is also looking to explore other business models in the near future. This includes city car clubs, digital advertisements, energy storage and Wi-Fi. The idea is to maximise the network's potential and provide other services in and around the network to increase the utilisation of charging points.



Robert Byrne
Founder and CEO
Franklin Energy

+44 (0) 345 123 0500

robert.byrne@franklinenergy.co.uk
www.franklinenergy.co.uk



Edward Leigh, chair of Smarter Cambridge Transport, on the city's measures to promote clean, smart and sustainable transport

Smarter Cambridge Transport

S smarter Cambridge Transport (SCT) is a voluntary group that aims to improve transport in and around the English city of Cambridge. The group gathers ideas from local residents, businesses and organisations to improve and refine travel options, make journeys safer, and reduce congestion and pollution in the heart of the university city. PEN spoke to the chair of SCT, Edward Leigh, about a variety of issues, including the state of Cambridge's transport systems, the need to reduce congestion and pollution, and efforts underway and proposals to get more people choosing active and sustainable transport options.



Edward Leigh



Likely starting in 2017, some powers and money will be devolved from central government to local councils in Cambridgeshire and Peterborough. Most significantly, these powers include planning and commissioning transport infrastructure from an annual budget of £20m – 60% capital, 40% revenue.

In 2015, Cambridge City Council and the region's dominant bus operator submitted a bid to the Office of Low Emission Vehicles (OLEV) for a grant to subsidise a fleet of hybrid diesel-electric-flywheel buses. The city council is also incentivising taxi drivers to use low and ultralow emission vehicles by issuing grants, installing dedicated electric charging points and incrementally raising emission standards. The aim of both initiatives is to reduce pollution levels in the city centre, parts of which regularly exceed European standards for air quality.

At the moment, traffic is managed in the city centre using 'control points' or 'virtual bollards', which limit access to cycles, buses, taxis and other authorised vehicles. There are plans to experiment with locating control points on and near the inner ring road, to push most of the traffic further away from the city centre and so free up space for buses.

There are also plans for new bus lanes and cycle ways, segregated where possible, on some of the radial roads into the city, new 'green way' cycle routes connecting the villages around Cambridge and providing safe cycle routes into the city. Although there is general support for segregated cycle lanes, there is deep scepticism that widening roads to

What transport challenges does Cambridge face?

Cambridge is suffering from growing pains: businesses are expanding and relocating to the region; house prices are some of the highest in the country, so lower-paid staff cannot afford to live in or close to the city; and the roads in and around the city are regularly heavily congested and polluted. Public transport has not adapted fast enough to the needs of the 100,000 or so who travel into Cambridge each day.

What are some of the projects attempting to address these challenges?

The big project underway right now is the Greater Cambridge City Deal. The UK government will potentially provide the City Deal with £500m (~€600m) over the next 15 years, most of which is earmarked for transport infrastructure and technology for Cambridge and South Cambridgeshire. This money may only be spent on capital projects and not, for instance, on subsidising public transport.

Congestion on Cambridge roads





© 2012 Klaas Brumann

accommodate bus lanes is necessary or the right intervention in the 21st Century.

Is there a smart cities initiative?

Within the City Deal there is a Smart Cambridge programme which seeks to gather and publish data, such as traffic flows, public transport timetables and fares, bus locations, parking availability, air quality, etc. By making this data available on an open platform, it is hoped that private companies, academics and enterprising individuals will develop useful apps on the back of it. The most obvious need is for a multi-modal, real-time journey planner that can optimise routes by time, convenience, cost and environmental impact – along the lines of the hugely popular Citymapper.

Is the University of Cambridge involved?

The University of Cambridge has a seat on the executive board of the City Deal. It does not get a vote, but it contributes to discussions on all proposals. The university has a particular interest in transport infrastructure as it is building extensively on land on the west side of Cambridge, with new department buildings, accommodation and staff amenities. Enabling

The award-winning Riverside cycle/foot bridge over the River Cam opened in 2008

Construction of the new Cambridge North railway station, due to open May 2017

staff and students to move around the city by sustainable modes of transport is a high priority. To that end, one site will have over 12,000 cycle parking spaces.

The University of Cambridge is actively involved in the Smart Cambridge programme, too. It is leading a related project on how to improve the algorithms used to convert GPS bus-tracking data into accurate, real-time passenger information displayed at bus stops around the city and, in future, via online apps.



© 2016 Network Rail



King's College Chapel

comprising Fulbourn, Cherry Hinton, and Teversham, which have a combined population of over 15,000. These would also be well served by a new station. If a frequent train service ran on this line to Cambridge and the Biomedical Campus, it would take thousands of cars off the road.

How are the building developments affecting the historic areas of Cambridge, such as parks, Nature reserves and historic buildings?

Some of the new developments on the city's south side are being built entirely on greenbelt land which used to be farmland. These have funded a new public park, which will be an important new asset for the city. A debate continues over how much more greenbelt land should be built on, and the current plan is to build settlements well beyond the greenbelt. But, given that most jobs and amenities are in the city itself, this plan risks placing an unsustainable burden on an already overloaded road network. This is why the City Deal is seeking to urgently improve public transport, in particular bus journeys.

There is a mostly uninterrupted green corridor through the city along the River Cam, which includes the Backs with the iconic view of King's College Chapel. The older university college buildings, some dating from the 13th Century, are clustered in the city centre along the river, mostly within the traffic-restricted zone. Many of those buildings are still exposed to pollution and vibration from heavy double-decker buses.

Our group's vision is for Cambridge to follow in the steps of cities like Groningen and remove all but essential motor vehicles from the city centre so that it can become a safe and enjoyable space for people to walk and cycle around. Beyond the centre, we want to see new segregated cycle paths and junctions, but sensitively integrated and landscaped to preserve the rural-urban character of the city.

What is being done to ensure that cycling is a safe alternative to driving in the city?

The cycling team at the County Council, lobbied, assisted and advised by Cambridge

Are rail networks being considered as another way of reducing congestion and pollution?

At the moment, Cambridge has only one railway station, just over a mile south of the city centre. A second station is being built, north of the city centre, near to Cambridge Science Park; this is due to open in 2017. Plans are now emerging for a third station, south of the city centre and close to the site of a biomedical campus. The site comprises Cambridge University NHS hospitals (Addenbrooke's and Rosie Maternity) and offices of the MRC, Cancer Research UK, AstraZeneca, GlaxoSmithKline and several other research centres. The combined workforce is anticipated to reach 30,000, so, including hospital patients and visitors, the site will be a destination for nearly 50,000 journeys a day.

SCT is lobbying with Railfuture to get more investment in rail. There are other locations where new railway stations would make a huge difference. Soham, for instance, is a village about 20km northeast of Cambridge with a population of around 10,000. It has a railway line running around it, but no station. The bus from Soham to Cambridge takes over an hour; a train would take half the time. On the same railway line, even closer to Cambridge but to the east, is a triangle of villages

Cycling Campaign, has steadily implemented improvements to the cycling infrastructure, providing more segregated cycle lanes, safer junctions and quiet routes away from arterial roads. Cambridge has always been a cycling city, but, as motor vehicle traffic has grown, it has become necessary, for safety and comfort, to provide dedicated and segregated cycle routes.

In the last decade or so, two shared cycle/pedestrian bridges have been built over the river and a major trunk road, with a third awaiting planning consent. Two dedicated medium-distance cycle routes have been opened: alongside the railway line to the south of the city runs the 'DNA path', which is marked with coloured strips to represent the sequence of bases in the BRCA2 gene; to the north, there is the guided busway cycle path, which follows two sections of disused railway line, now converted for use by specially adapted buses. The longer section extends nearly 20km to the market town of St Ives, and now carries 1,500 cycle trips per day, many of which are long-distance commutes. Work continues on upgrading and extending another cycle route, out to Royston, a town 20km to the southwest.

The biggest challenge is in redesigning junctions, where most accidents occur. Space and time have to be allocated optimally to keep everyone safe and moving. Cambridge pioneered in the UK advance-green lights for cyclists, allowing them to enter a junction ahead of motor traffic. It is now consulting on its first Dutch-style redesign of a roundabout, where people on foot and cycles crossing each arm of the roundabout have priority over motor vehicles.

With funding provided by the City Deal, Cambridge has the opportunity to greatly enhance the quality of the cycling infrastructure in and around the city, following the example of Dutch and Danish cities where more than 50% of people travel by bike. We hope that Cambridge will continue to innovate and learn from other cycle-friendly cities: London (UK), Copenhagen (Denmark), Groningen and Assen (the Netherlands), Ljubljana (Slovenia) and Portland (Oregon, USA).

Are there any further changes that your group is advocating?

We have proposed that Cambridge considers what we term 'inbound flow control': traffic lights on all of the city's approach roads would be programmed to hold some of the traffic at peak times just outside the city. Regulating the rate of flow of traffic entering the city would minimise or even eliminate congestion. Buses would be able to move freely within the city, so they wouldn't need dedicated bus lanes. The only necessary road infrastructure would be at the edge of the city to provide queuing space and a bypass lane for buses, emergency service vehicles and possibly other authorised vehicles to skip to the front of the peak-time queue.

This technique, known technically as 'peripheral gating', has been employed very successfully in Zurich, Switzerland. It's also used on a smaller scale in other cities to protect centres from becoming over polluted and gyratories from seizing up.

Unfortunately, local highways officers are sceptical about our proposal; we are very keen to hear from experts who could help evaluate it.

Smarter Cambridge Transport is also focusing on how to make bus services more convenient and useful. We would like to see investment in rural travel hubs or interchanges, with excellent local connections by foot, cycle and car, and the kinds of facilities you would expect at a small train station.

We recognise the need to make interchanging between transport modes as simple and painless as possible. At the moment, Cambridge has a central bus station more than a mile away from the train station and effectively distributed across a number of streets. This adds considerably to journey times and complexity. SCT has a radical proposal where express buses would circulate around the inner ring road (circumference 6.5km) in the same direction. Passengers could get off at any point, walk no more than two bus bays along the road, and catch another bus to anywhere in the city.

What is your ultimate goal?

Cambridge and the surrounding region face a huge challenge but also great opportunities. With vision and leadership, Cambridge could become the sustainable transport capital of the UK. Wouldn't it be wonderful if people did not feel they need a car to enter or get around the city? If our streets were designed for people, not motorised vehicles, everyone would benefit: there would be greater social inclusion and interaction; wildlife would regain habitats; and people would be healthier, fitter and less stressed.

Edward Leigh
Smarter Cambridge Transport

<http://www.smartertransport.uk/about-us/>

Rising to new heights

The Canadian Urban Transit Research and Innovation Consortium shows why Canada is rising high in research and innovation

It's fitting that a start-up consortium taking hold in Canada has been established to promote innovation and clean tech transit. After all, Canada is home to the oldest and longest fully automated, driverless, rapid transit systems in the world. Vancouver's SkyTrain opened in time for its unveiling for the World Expo in 1986. Again, the future looks bright for Canadian innovation now that there's an organisation to champion its cause with the founding of the Canadian Urban Transit Research & Innovation Consortium (CUTRIC).

Established to co-ordinate innovation needs among private and public sector transit, mobility and transportation stakeholders, CUTRIC is a member-based organisation that partners members of transit and transportation industries with academic researchers. This independent consortium was incorporated in August 2014 to support industry-led research and development projects across Canada, focusing on advanced public transportation systems, including low emissions electric, hydrogen fuel cell, and natural gas powertrain and propulsion solutions, light-weighting solutions, digital analytics solutions, command and control software solutions, and transit planning solutions. Its launch in 2015 marked the first steps towards a co-ordinated set of provincial-federal funding policies aimed at supporting research, development, and demonstration (RD&D) in Canada's transit, transportation and mobility manufacturing sectors.

The consortium is tasked with bringing together industry and academic capabilities to drive forward innovation projects. It is working with the National Research Council (NRC) to plan a commercialisation pathway in the future for the innovations emerging from stakeholder projects. A main goal is to seek co-financing from private, municipal, provincial and federal

sources for the purposes of de-risking the costs associated with these projects. CUTRIC supports industry-academic collaborations in the development of the next generation of technologies for Canadian transit systems. These advancements will help drive forward innovation in transportation across Canada, leading to job growth and economic development. They will also lead to innovative solutions to decrease fuel consumption, avoid wasted assets, and reduce redundancies in operations, thereby saving taxpayers' money while supporting entrepreneurial opportunities for Canadian innovators.

CUTRIC also enjoys the support of Canada's transportation business community, most notably with its founding private sector member organisation, Thales Canada, Transportation Solutions. Their support and investment in CUTRIC started in the belief that the private sector needs to lead innovation strategies in Canada. As an international leader in global rail technology and innovation, their involvement influenced other leading firms to join the cause and set the course for increased engagement among private sector interests with CUTRIC.

The end goal is to produce an industrial renaissance in Canada in the areas of low emissions, lightweight, digitally connected, highly efficient, user-friendly transportation systems across all modes of transit, including bus, rail, trolley and on-road transit vehicles within the next five years. This work will help make vehicles used by transit systems more efficient and less fossil fuel intensive, thereby significantly reducing emissions from transit systems and supporting the country's shift to a low carbon economy.

Government milestones

CUTRIC is enjoying a steep rise in support from its government partners, most notably at the national level, as well as in the provinces of Ontario, Quebec and British Columbia.

Early in 2016, Ontario minister of economic development, employment and infrastructure, Brad Duguid, committed CAD 10m (~€6.8m) to CUTRIC in partnership with the federal and Quebec governments. Through the Business Growth Initiative, Ontario will directly invest \$10m over four years for CUTRIC-supported projects for R&D and the commercialisation of technologies.

In response to the Ontario announcement, CUTRIC's executive director and CEO, Josipa Petrunic, noted three elements needed to make the plan succeed: "The government has to have the guts to lead the shift to a clean tech economy, has to have the vision of zero emission transportation, and has to be committed to



Ontario Premier Kathleen Wynne announced CAD 10m support for CUTRIC's Research and Innovation projects in April 2016

relationship building between provincial and federal government partners along with transit system champions. Ontario can become a world-class testing ground for advanced transit innovations that serve the needs of 21st Century mobile citizens,” she stated. “Canada will be leaders on the world stage bringing innovative research and testing into reality.”

New transportation technologies showcased at the Canadian Urban Transit National Research & Innovation Forum

On 28 June 2016, CUTRIC hosted its Canadian Urban Transit National Research & Innovation Forum. This is Canada’s inaugural RD&D forum dedicated to advancing transit and transportation solutions and technologies in Ottawa. This event was in partnership with the National Research Council of Canada (NRC).

Moderated by Petronic, a roster of senior government and business leaders spoke at the forum: Michel Dumoulin, general manager of automotive and surface transportation, NRC; Pam Damoff, MP, Oakville North-Burlington; Cristina Martins, Ontario member of provincial parliament for Davenport, and parliamentary assistant to the minister of economic development and growth; Mario Peloquin, vice-president, business development, Thales Canada, Transportation Solutions and CUTRIC vice-chair and board member; and Alexandre Beaudet, project manager, InnovÉÉ.

The forum provided a platform for over 50 researchers to deliver their technology innovation project proposals. The presentations were by Canadian companies, universities and research partners keen to invest in and develop zero emissions vehicles, lightweight materials, advanced transit and transportation analytics, automated and connected vehicle systems, and cybersecurity solutions for vehicle communications.

“At this forum, we facilitated RD&D partnerships to get dozens of projects off the ground and into practice by Canadian transit systems,” says Petronic.

“Driving down emissions, improving transportation and creating greener, cleaner and more mobile communities starts here with CUTRIC,” she continues. “The goal of our technology projects is to drive down emissions, improve transportation networks and create a greener, cleaner, more mobile society across Canada.”

Looking further into the future, project evaluations are underway in order to earmark funding for those that are ‘shovel ready’ and can start right away. In the longer term, planning has already begun to hold the second annual Research and Innovation Forum in 2017 and build on the event’s success to scope out the next projects for the consortium’s support.

Pan-Ontario electric bus demonstration and integration project

The Province of Ontario is supporting the CUTRIC-led pan-Ontario bus demonstration trials with partnerships between industry, government and transit systems. At the funding announcement in April 2016, Ontario Premier Kathleen Wynne affirmed her support of our work and her commitment to the province being a clean

CUTRIC matches industry needs to academic capacities and capabilities, including laboratories, highly qualified personnel and cutting-edge knowledge.

CUTRIC’s vision:

To make Canada a global leader in transportation-related research

CUTRIC’s mission:

To support research, development and innovation through industry-academic collaborations that bring advanced thinking, design and manufacturing to Canada’s transit and transportation networks

Five pillars:

CUTRIC works to organise, co-ordinate and support the clustered growth of RD&D related to:

- Alternatively fuelled propulsion systems for low carbon vehicles (such as electric, fuel cell and natural gas buses, trains and other transportation vehicles);
- Big Data solutions and data analytics for operational cost reductions in advanced signalling systems for efficiency and safety gains;
- Autonomous and driverless systems for efficiency and safety gains;
- Digital securitisation of communications between onboard and offboard components and systems; and
- Consumer/rider applications for customer satisfaction.

tech leader: “This deployment of low carbon transit options lays the foundation of Ontario as a world leader in innovative transportation technologies.”

As part of this trial, transit agencies will aim to work with bus manufacturers (New Flyer Industries and Nova Bus/Volvo Group) and the federal NRC to investigate and demonstrate the innovation outputs and deliverables that will help move electric buses towards full commercialisation in Ontario post-trial.

“Meeting Canada’s climate change goals drives this leading edge research development and demonstration work,” states Petronic. “These projects prove Canadian innovators are ready to support Canada’s Paris climate change commitments with emissions-reducing transportation technologies.”



Josipa G Petronic, PhD
Executive Director & CEO
Canadian Urban Transit Research and Innovation Consortium

+1 416 358 3206

josipa.petronic@cutric-crituc.org
www.cutric-crituc.org

PEN examines the European Commission's efforts to implement clean energy targets in the transportation sector

Transportation targets

Clean transport is an EU priority and essential to efforts to limit global warming. Transport comprised 26% of all greenhouse gas emissions in the EU in 2014, and so finding clean and ecofriendly alternatives is vital. This has also been earmarked as a priority by the European Commission, which has pledged to limit global warming to 2°C above 1990 levels as part of the Paris Climate Agreement, while setting its own more ambitious target of 1.5°C above 1990 levels. In order to make achieving these targets possible, investment in sustainable transport and decarbonisation of the industry will be paramount.

The commission's plan

In a speech delivered on 23 May at the European Parliament, the European commissioner for transport, Violeta Bulc, outlined her vision for investment in transport: "Within Europe, my focus is on the single market. I want to make sure that transport is as efficient as possible, that it is an enabler of the economy and not an obstacle. My focus is connectivity and global leads through economic diplomacy."

Bulc emphasised that the main drivers of change in transport will be investment and innovation: "Investment is essential. Good, seamless connectivity, through a safe, clean transport network, meeting the needs of consumers and needs of businesses will help Europe to stay ahead of the curve and remain competitive globally. To achieve our goals, I would like to stress in particular two drivers: research and innovation

The EU has announced measures to make charging stations for electric vehicles more widely available to encourage their use



with disruptive innovation in the lead, and sufficient financing such as blending public and private funds."

There is already a steady stream of investment into transport through Horizon 2020, which has sponsored a number of related projects. Bulc praised this commitment and acknowledged that it would trigger further funds from private sector companies and others in the transport industry: "The four transport-related joint undertakings (Shift2Rail, SESAR, Clean Sky, and Fuel Cells and Hydrogen) will receive a total budget from the union of approximately €2.7bn over the seven years of the programme. This will leverage at least €3bn in further contributions from the industry. These grants will fund projects and help create resource-efficient transport that respects the environment, smart equipment, infrastructures and services, and improve transport and mobility in urban areas. So we are delivering in a very efficient and focused way."

Decarbonising the industry

Outside of the European Commission, a number of European transport associations have called for new measures to decarbonise the transport sector. In an open letter, officials from six organisations – the Community of European Railway and Infrastructure Companies, European Rail Infrastructure Managers, the European Rail Freight Association, Transport & Environment, the International Association of Public Transport and UNIFE – have urged that a 60% greenhouse gas reduction target be confirmed in EU legislation, and have asked for more transparent reporting to better monitor the progress of member states and incentivise them to improve.

To meet the 60% target, which was initially proposed by the commission's 2011 Transport White Paper, emissions in the transport sector will need to be cut by 67% between 2013 and

2050, and a shift towards rail and freight transport is absolutely crucial to meeting these targets. The letter makes a number of other recommendations, including enhancing the performance of the rail sector and the more effective implementation of EU rules, which it expects will encourage more consumers to choose rail over less environmentally friendly but higher performing alternatives.

Additionally, the letter advises a number of policy reforms which the six organisations feel will have a positive impact. For example, the abolition of tax-free kerosene and airlines receiving 85% of their emissions allowances for free under the Emissions Trading System would reduce the popularity of aviation, and subsequently reduce resultant emissions, while the low taxation of diesel in some member states is described as 'not compatible with decarbonisation'.

The letter suggests that an annual reporting system should be developed, which would encourage clearer reporting of statistics and more effective greenhouse gas reduction targets for the transport sector, which would in turn encourage member states to make more progress in decarbonisation efforts. In addition, the organisations call for greater investment in new, cleaner energy technologies, which was also highlighted by Commissioner Bulc as a priority for the commission's decarbonisation initiatives.

Clearly, efforts towards clean energy are needed to cap greenhouse gas emissions, and the transport sector is one area in which dramatic changes could be made towards this goal. According to the European Commission's figures, some 94% of Europe's transport is dependent on oil, 84% of which is imported at a cost of up to €1bn per day, so there are also economic benefits to reducing the EU's dependence on oil.

The railway package

Adopted in 2014, the 'Clean Power for Transport' package is part of a number of specific EU initiatives aimed at delivering clean energy for the European transport sector by establishing minimum coverage of electric vehicle charging stations. The package comes in response to the identification of a cycle of challenges that have acted as barriers to a large-scale adoption of electric vehicles as the



Europe's rail industry is a key priority for the European Commission economically, but decarbonisation is needed if the sector is to grow without creating more pollution

industry standard: the high cost of vehicles, limited consumer enthusiasm and a lack of refuelling stations. Member states will have to set and make public targets and national policy frameworks for the implementation of alternative refuelling points which support charging for electric vehicles, and the commission hopes that by tackling this element of the chain, a wider adoption of electric transportation can take place.

In line with these standards, the commission has taken a number of actions towards securing their success. For example, in April the European Parliament and the EU's Council of Ministers agreed on a fourth railway package which would see an expansion of European rail services in line with the need to promote public transport in combatting global warming. The package, which remains subject to agreement from the member states, is designed to bring competition to domestic passenger rail markets, thereby returning some viability to railways and making them better able to respond to market and consumer demand.

The entrance of new competitors will force all rail service providers to adapt to the needs of consumers, and public service contracts will be awarded subject to achievement of performance targets such as quality of service and punctuality.

It is vital that legislation such as the railway package is brought in quickly, as it is estimated that the transport sector will overtake the energy sector to become the highest emitter of pollutants by 2030 if action is not taken. In a speech at the European Rail Summit 2016, Commissioner Bulc highlighted her intention to grow the transport sector and insisted that decarbonisation would need to occur simultaneously with growth to avoid the potential of additional pollution. The commission has made clear its position that decarbonisation is a priority in the transport sector, and it is expected that renewed efforts to boost rail transport on the continent will go some way towards achieving this goal, but how much progress will be made remains to be seen.

Jos van der Burgt of DNV GL reflects on the trends, obstacles and future developments associated with batteries for electric vehicles

Energised outlook

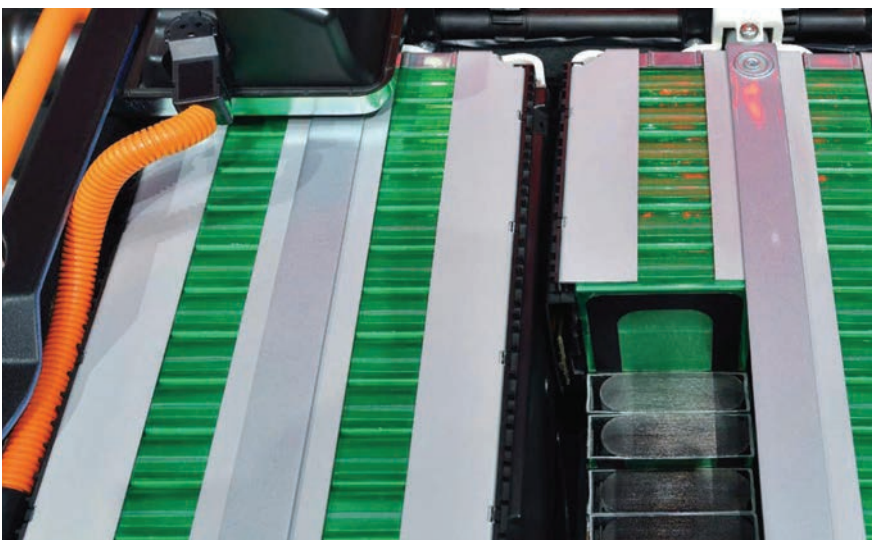
Tesla Motors has proven to the mobility sector that an electric vehicle is a regular car with the looks, power and the range of a 'real' car. The next steps that the EV developers and manufacturers need to take are: making lighter batteries and lighter vehicles to increase the range of the EV; and lower the price of EVs to make them affordable for a larger customer base.

Regarding battery pricing, a recent article in *Nature* showed that there is a clear trend of EV battery prices dropping. However, it seems that the price goal for widespread commercialisation will remain a challenge for the next decade.¹

Battery technologies

The major technology in EV batteries is still the Li-ion chemistry in different varieties. Research and development from some large manufacturers has shown that optimisation of present chemistries is the major work priority for the next five years (for example: Tesla states that their present chemistry, NMC (Li-manganese batteries blend with lithium nickel manganese cobalt oxide) will work well for the next five years). Research topics in battery chemistries are Li-sulfur, Li-air, other metal-air, and the use of innovative materials, such as graphene layers, for better and safer performance.

The solid-state battery could be a breakthrough, because it is more compact and has a higher power output and energy density than present Li-ion batteries. In the solid-state battery, the liquid electrolyte in most existing Li-ion batteries is replaced with a solid ceramic or polymer electrolyte. This promises better stability/safety and also more flexible shapes for better packaging inside a vehicle. The expected timeline for commercialisation is around 2020.



Range

All major car manufacturers aim at long-range EVs (at least >250km).

Examples:

- The 2017 BMW i3 has a battery capacity of 33 per kilowatt hour (kWh);
- The Chevrolet Bolt will have a range of at least 320km (200 miles) and a starting price of about \$27,000 (~€23,700) when it goes on sale later this year;
- The Tesla Model 3 is expected to have 345km (215 miles) of range and will go on sale in late 2017 (at a starting price of \$35,000);
- Ford CEO Mark Fields said they will not be left behind in the race to develop long-range electric vehicles like the Tesla Model 3 and Chevrolet Bolt that can go 320km or more on a single charge; and
- Mercedes is working on a range of electric vehicles able to cover up to 500km on a single charge.

At the same time, for EVs to gain meaningful market share, the US Department of Energy (DOE) has determined that battery costs need to be cut from \$400-\$600 per kilowatt hour to \$125/kWh, and battery lifespan needs to be extended to 15 years from its current eight years.

Decrease charging time

If long range EVs with large batteries are the new standard, this calls for fast charging; meaning high-power charging. Some sources call a power of 100kW 'fast charging', but if your EV battery is 40kWh this still takes you 20-30 minutes to recharge, which is not particularly fast in the real world. So fast charging will need to go beyond 100kW in the near future.

On the other hand, if you have time on your side (charging at the office or at home), you do not need fast charging. For example, in smaller European countries like the Netherlands, Belgium and Denmark (and others), a single EV charge will cover a trip across the whole country, although, of course there will probably be a need from specific drivers for real fast charging in these countries. Furthermore, future private mobility might be arranged differently: use one car for commuting, use/rent/lease another for long distance trips, such as holidays. This would mean that a long-range EV (and fast charging) are not needed in large numbers.

On the standardisation side, the future of EV charging is pictured by the EU already: the 'Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure' (October 2014) shows a clear path supporting the rapid adoption of the combined charging system (CCS, that is: sockets, plugs and communications). This is a combination of the connector 'Combo 2' for DC and the connector 'Type 2' for AC charging. From 18 November 2017 onwards, the member states of the European Union must equip their fast charging stations with CCS. They may continue to operate their existing charging infrastructure, but must at least provide CCS in their expanded or new infrastructure. Some original equipment manufacturers (OEMs) from the USA have already announced that they will also accommodate CCS.

V2G: vehicle-to-grid

V2G means that the EV battery is not just charged from the grid, but also delivers power back to the grid (instead of only delivering driving power to the car itself). On the technical side, this implies more charging/discharging cycles, so a decreased calendar life (more cycles per year, therefore fewer years). Thus there is a need for battery technology with high cycle life. Also, the charging post (EVSE) and the on-board EV charger and/or control system need to be more advanced, especially with regards to two-way power delivery.

On the services side, this opens new EV applications; such as power delivery to the grid, balancing the power grid, and relieving the local distribution grid in case of stability problems. All

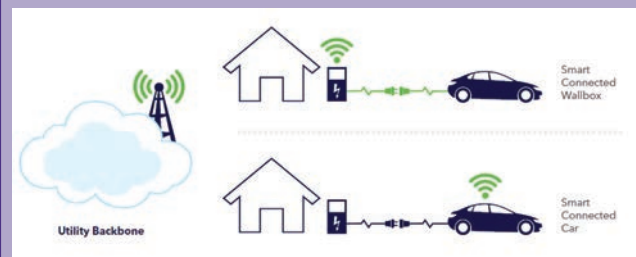
A vision of the future: "What's driving tomorrow's electricity grid?"

The widespread adoption of electric vehicles holds the potential for a more sustainable future for both the automotive and electric power industry. DNV GL and EFS investigated how close collaboration between these two historically distinct industries could reduce the total cost of ownership of an EV, improving the value proposition for original equipment manufacturers, utilities, and most importantly, their (shared) end customers.

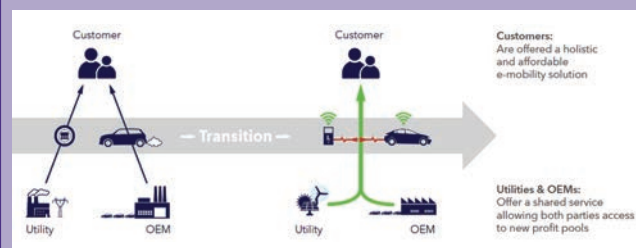
Increasing EV sales could provide OEMs (i.e. vehicle manufacturers) with a means of complying with ever-stricter CO₂ fleet targets.

Meanwhile, for electric utilities, traditional revenue streams from conventional generation plants are becoming increasingly unprofitable. There are many reasons for this, most notably the rising penetration of renewable generation, at both transmission-grid as well as local level (e.g. rooftop solar panels). EVs have the potential to open up new revenue streams for those utilities that are willing to adapt their business models and transition from their traditional role as commodity providers as well.

This paper envisions a future in which the EV battery is an asset that alternatively may also be owned by the utility, rather than the EV user. In this new business model, the utility may seek close co-operation with an automotive OEM. Customers would need to make a smaller upfront investment for the EV (thereby increasing OEM sales), alongside periodic payments for sharing use of the battery with the utility. The utility could harness the flexibility of the battery as a means of energy storage to create value via two key concepts: alternative use (i.e. V2G) and second use (the battery with a remaining capacity of 70-80% is taken out of the EV for further utilisation in the power grid).



Connectivity options between utility and EV for alternative use (= V2G). [Source: DNV GL]



Business model transition for utility and OEM. [Source: DNV GL]

For more see EFS and DNV GL position paper on EV and smart grids at <https://www.dnvgl.com/energy/brochures/download/emobility.html>



of these could have financial benefits for the EV owner/driver. In addition, the EV driver will play a more active role in the local power delivery system. The vehicle can support the community grid; the driver will be able to charge their EV battery at the office with green photovoltaic power, and the vehicle's battery can discharge in the evening at home to provide green power to the home and neighbours. Thus the consumer/prosumer-centric sustainable microgrid is supported.

Steps to better realise interoperability and interchangeability in EV batteries and charging:

- Interoperability: standard protocols between EV (the car) and EVSE (i.e. charging stations); if variations exist then all devices should handle these variations;
- BMS interoperability: this is needed if second life for EV batteries takes off. (Alternatively, OEMs may offer their own second life battery packages in the future);
- Interchangeability: plugs and sockets: it is difficult to reach one standard, however the CCS mentioned above is a good way forward (but this is EU only and the world is larger than that); and
- Battery interchangeability: batteries are specific to the vehicles (and OEMs want to have it like that, i.e. full freedom). If all OEMs want the best batteries, only a few battery suppliers will be left in the end, automatically realising better interchangeability and standardisation. Also, groups of OEMs might team up with groups of battery manufacturers, which could also lead to further standardisation; leading to lower costs, higher quality, safer designs and better options for second use of EV batteries.

Considering the interests of the EV and the power grid regarding services offered, who is in command while charging the EV: the EV or the charging post? For the power grid it is easier to communicate with the charging post than with the EV (but then both EV and grid want to be in command over the EVSE). In future standardisation work, the focus needs to be on co-operative control.

Importance of EU funding to EV battery research, including the EGVI and Horizon 2020

The importance of EU funding is that it brings guidance (direction: focus on winning developments, continuity); stimulates co-operation (building a strong EU industry with successful products, OEMs work together with competitors and with firms outside of the car industry); stimulates standardisation of performance and quality criteria and testing/verification methods; and it stimulates interoperability.

There a number of important topics being supported right now by EU funding:

- EV as a system (not a collection of components);
- New battery materials to increase performance, longevity and safety;

- Cost reduction of battery, BMS, EV systems;
- Battery size reduction, i.e. more kW and kWh per kg, per litre;
- Safety of batteries and of packaging inside the car;
- Reliability and expected lifetime of EV batteries;
- Integration into society/consumer acceptance of EVs including safety concerns, range anxiety, costs and car sharing;
- Charging infrastructure: integration into the existing power system, automatic smart charging, meeting the need for fast charging;
- The environment: re-use (second life), recycling of EV batteries; and
- Lightweight materials for EV (and green fuels; energy management and efficiency). This will help create lighter and more efficient cars, helping save on battery power and the energy needed.

Dutch leadership in the EU?

Policy and regulation should match the R&D goals and thereby facilitate innovations. Emerging and future business models for individual mobility may not necessarily incorporate individual possession of a car. It could also be: car sharing, improved public transport, apps for optimal route planning, and so forth. Car sharing concepts need to be further stimulated to increase the EV market share and to decrease the total number of cars on the roads, streets and parking areas.

Incentives on plug-in hybrid electric vehicles – which are supported by tax reductions in the Netherlands – are ‘perverse’. Many PHEV drivers welcome the tax reduction and then drive on petrol and just do not recharge the battery. We believe a subsidy on full-EVs is acceptable and needed, not on hybrids. The best policy option is to focus on air quality and the link with car emissions, possibly focusing on city centres, with policy leaders establishing environmental protection zones, such as those that have been pursued in Germany.

In the Netherlands, the Dutch government has considered the question: how good or safe will the batteries of second-hand electric cars be after three to five years? Parties in the

Objectives and scope of the European Green Vehicle Initiative (EGVI)

According to the Horizon 2020 regulation, the development of ‘Smart, Green and Integrated Transport’ is a major societal challenge for Europe. The EGVI PPP addresses this challenge: it aims at delivering green vehicles and mobility system solutions which contribute to the development of a competitive and sustainable transport system in Europe. Involving the automotive, smart systems and smart grids industries in a cross-sectoral approach, it should also have a positive impact on the innovative strength and global competitiveness of the European economy.

The scope of the European Green Vehicles Initiative focuses on the energy efficiency of vehicles and alternative powertrains in the road transport sector. It covers several types of road vehicles, from passenger cars, trucks and buses to two-wheelers and new vehicle concepts.

The topics addressed within the EGVI PPP need to respond to this goal of energy efficiency of vehicles and alternative powertrains. They concern all the technologies required at various product layers – from modules to systems and vehicles, as well as the integration of resources and the integration into the infrastructures. The objective of this integrated approach is to cover the entire process chain from resource application to demonstration and creation of services, and to extend research and development to innovation.

PPP – this means commitment of both government and industry

EGVI co-operates with European Technology Platforms (ETP) ERTRAC (road transport), EPoSS (smart systems integration) and smart grids.

Netherlands are now developing ideas for setting up a quality certification standard for second-hand EV batteries.

Indeed, on March 29 the Dutch parliament accepted a resolution by the PvdA (Labour party) to summon or appeal to Minister Henk Kamp (economic affairs, VVD (Liberals)) to stimulate the sales of electric vehicles. According to the resolution, the cabinet should ‘strive for’ a situation where only emission-free cars are sold in the Netherlands in ten years’ time.

1 “Rapidly falling costs of battery packs for electric vehicles”, <http://www.nature.com/nclimate/journal/v5/n4/full/nclimate2564.html>

Jos van der Burgt
DNV GL

www.dnvgl.com

Mikko Pihlatie discusses electric commercial vehicles, mobile machinery and maritime vessels as the transport of the future

The way of the future

Key challenges in urban transport systems are carbon footprints, local emissions, noise and congestion. Electrical transportation on rails already plays a significant role in the sustainable transportation system today. The currently ongoing paradigm shift to electric mobility concerns the electrification of private cars and commercial road vehicle fleets serving the urban transport system. Combined with novel ICT-based mobility services, these offer the most potential as solutions to the challenges at hand. Off-road vehicles and construction and maintenance machinery integrate seamlessly into urban society, transport and production systems. Electric and hybrid ships and ferries are currently fast emerging in various applications in waterborne transport. Electrification also shows remarkable promise in special machinery used in logistics and production systems such as cargo handling in ports and the mining industry.

The key technology enabling this mobility transformation is the storage of electrical energy in advanced secondary batteries. There are different types of lithium-ion (Li-ion) batteries available on the market with sufficient performance in terms of capacity, power and lifetime for the different applications. The battery manufacturing industry is not consolidated yet; economies of scale and mass production are expected to reduce the cost of batteries. The exact choice of battery technology and dimensioning depends on application-specific requirements on, most critically, power, capacity, safety and cycle life. It is very interesting to note that the same battery technologies are now being adopted for stationary grid-serving applications. Seamless integration of the mobile and stationary storage systems, charging infrastructure for electric vehicles and the power grid with distributed renewable generation offers synergies and emerging business opportunities.

Commercial vehicle fleets such as city buses, logistics, freight and waterborne transport operate under open competition, provided that the necessary charging infrastructures are arranged by public or private actors. Reliability and operability of the vehicles and ferries are central factors of production for the fleet operator. Fully electric city buses are likely to showcase the first market-based introduction of heavy electrically driven road vehicles justified both in commercial and environmental terms. The viability and productivity of such systems are currently being tested by public transport authorities and operators across Europe. Such pilots utilise both simulated and real-life data from vehicle technologies, energy use and operation; many cities are currently planning to enter into rollout phase.

The competitiveness of different technologies and system solutions in transport can be compared by analysing the total cost of ownership (TCO). Therefore it is important to study and understand the techno-economic frame and competitiveness of the different technology and system solutions and operation concepts in order for the commercial electric vehicles to be a success. The system TCO includes the capital cost of the vehicle and the traction battery (with their respective depreciation times), fuel and charging infrastructure cost, as well as service and maintenance. For electric vehicles, the capital cost is still high compared to conventional vehicles, but the operational costs are lower, mainly due to cheaper energy.

The transport can significantly benefit from electric and hybrid vehicle system solutions. In facilitating the ongoing change, it is important to identify the technologies with the most potential, use cases and operation concepts within urban transport where reduced system level TCO can be reached through electrification. Critical factors and parameters such as cost structure, productivity, service, maintenance, ownership of batteries and charging infrastructure need to be evaluated at system level. Configuration of the charging infrastructures and the scalability of the infrastructure upon rollout is essential for efficient operations.

While facing a very promising technology, many tasks for development remain. A key requirement is to reach interoperability of vehicles within the available charging infrastructures, even across vehicle categories. The on-going standardisation of the charging technologies and solutions will benefit this development.

The relevant network of technology and service providers needs to be formed. Procurement, tendering and contracting models may require amendments to take into account the features of the systems such as technological maturity, risks and ownership. The value of the environmental impacts arising from reduced emissions due to electrification can also be assessed in economic terms. The socioeconomic impacts emerge from clean, quiet and sustainable cities with improved quality of life.

Mikko Pihlatie, DSc (Tech)
Research Team Leader
Electrical Powertrains and Storage
VTT Technical Research Centre of Finland

+358 400 439395

mikko.pihlatie@vtt.fi

The mobility and business of the future

Electric vehicles, particularly commercial ones, are the future of both mobility and business, as the ECV project explains

Transport, mobility and production systems are undergoing a transformation towards electrification. Electric Commercial Vehicles (ECV) is a networked research and development project entity running under Tekes' EVE programme from 2012-2016 that was nationally set up to support this transformation in Finland. ECV consists of a public research project and a number of commercial research and development projects run by companies. Public transport authorities (PTAs) and cities are also active in their own development projects regarding the electrification of public transport. The network comprises more than ten industrial projects and the participation of more than 30 companies through joint funding of the public research project.

ECV creates an extensive and diverse testing and expert infrastructure for electric commercial vehicle-related industries. In this context, 'commercial vehicle' is to be understood in the broad sense, including commercial vehicles such as buses and trucks, utility vehicles, cargo transport and non-road mobile machinery as well as light and heavy passenger cars. What is more, the projects address most of the relevant value chain, ranging from components, subsystems and complete vehicles to the integration of the ECVs into the transport system and the power grid. The need for such an inclusive approach arises from requirements for more efficient, productive and sustainable solutions in public transport, logistics and industrial production.

ECV gathers together a large number of companies in industry, research institutes and universities. The network and results of ECV are directly exploited by approximately 30 domestic or international technology companies that are positioned differently

at the electric commercial vehicle value chain. Collaborators and those who benefit from the activities include several public domain stakeholders, too. VTT Technical Research Centre of Finland is the co-ordinator of the ECV network. The research partners have included Aalto University, Lappeenranta University of Technology, Tampere University of Technology, the University of Vaasa, and the Helsinki Metropolia University of Applied Sciences, which took part during 2012-2013. In the public research domain, the topics of research, organised as work packages of the project, are: 1) battery technologies; 2) electric buses; 3) hybrid working machines; and 4) systems including charging technologies for heavy duty applications, power grid aspects, ECV system design as well as techno-economics of electric commercial vehicle systems.

The focus of ECV is on the electrification of commercial vehicles such as buses and mobile machinery, aiming at new development topics, products and system pilots. The topics are addressed by combining applied research, open development platforms such as VTT's own prototype electric bus, and living lab type system pilots. The technological highlights of the ECV projects include the following outcomes in terms of new industrial activity, products, facilities and pilot activities:

- The electrification of public transport – electric bus pilots are ongoing in the Helsinki region as well as in the cities of Turku and Tampere;
- Linkker Ltd, an electric bus manufacturer established as a spin-off of VTT, whose current order book contains around 20 fully electric buses;
- Kalmar released hybrid and fully electric straddle carriers, FastCharge™;
- Visedo electric and hybrid powertrains have been implemented in several vehicles and working machines; and
- New R&D facilities and capabilities are available at VTT and universities.



VTT's prototype fully electric bus is an open R&D platform within ECV. During one week in May 2014 it was operating on a commercial bus route in the city of Espoo



Mikko Pihlatie
The ECV Project

+358 400 430 395

mikko.pihlatie@vtt.fi
<http://www.ecv.fi/in-english/>

Micha Lesemann, chief engineer at RWTH Aachen University's Institute for Automotive Engineering, discusses the electric vehicle landscape in Europe and explains why public acceptance and changing boundary conditions are key

Electrifying Europe's roads

"Today, transport represents more than 30% of the final EU energy consumption. If we do nothing, by 2030 transport will become the largest emitter of CO₂ – overtaking the power sector. With renewed political focus in the light of COP21, now is the time to build on the momentum for cleaner transport and a more resource efficient transport network. Research and innovation can help us find new, sustainable ways to power the network and optimise use of existing infrastructure."

With these words, European transport commissioner Violeta Bulc opened the sixth European Transport Research Arena in Warsaw, Poland, a four-day event which aimed at finding 'innovative solutions for tomorrow's mobility' – solutions like plug-in hybrids and fully electric vehicles. According to Bulc, 150,000 (new) such vehicles were sold in 2015, while the number of electric charging points increased to 70,000 (up from 40,000 in 2014). A JRC report adds that the share of electric vehicles produced in the EU is also on the rise.

To find out more about the electric vehicle landscape in Europe, PEN spoke to Micha Lesemann, chief engineer at the Institute for Automotive Engineering (ika), an RWTH Aachen University body working to design and create the vehicles of the future. Here, he discusses the benefits of electric vehicles, the importance of winning public acceptance, and what's needed to get more electric vehicles on the road.

How would you evaluate the electric vehicle transport network architecture in Europe?

There's a lot going on across Europe at the moment. In Germany, for example, there are a number of activities to do with quick charging and



Micha Lesemann

charging station installation along the major transport routes. We are involved, in terms of research, in defining the optimal positions for charging stations in the national 'SLAM' project (www.slam-projekt.de). There are also many local activities taking place in this area – for example with energy providers, who have, over the past few years, already provided some charging stations across cities.

Another area of interest is the diesel issue, which is having a big impact, and we don't know yet what the effect of this will be. We're already seeing a lot of activities being started or increased with a clear focus on taking electromobility to the next level.

Has enough progress been made in developing an electric vehicle transport network, and what particular challenges have you encountered along the way?

This is a classic chicken and egg problem. On the one hand, you need the sufficient range that the electric vehicles provide (mainly by the battery and the consumption of energy within the vehicles) for movement as well as acclimatisation, in-car entertainment and comfort or, put simply, you need to fulfil customer demands in terms of range and functionality. These factors are being addressed from many different perspectives – technical, acceptance, legal and safety. There is still a lot ongoing.

On the other hand, all this has an impact on what the energy network (by means of charging stations/distribution) is asking for, so there are developments at both ends: battery chemistry is getting better and charging networks are being established.

In the meantime, we are of course seeing the first products on the roads, and many of the research questions have been solved. But the market impact (in terms of sold vehicles) is still very little. The German government recently



ika's fully electric research vehicle SpeedE

announced that it will subsidise electric vehicle purchasing – buyers will receive €4,000 for fully electric vehicles and €3,000 for plug-in hybrids – so that's an example of how political activity has increased here in Germany. Other countries are supporting electric vehicles for longer times, either by direct financial support or via indirect support, i.e. by granting electric car users 'privileges' like being able to use bus lanes, being able to park in certain areas, or exempting them from congestion charges when entering a city.

Are the German government and other EU member states doing enough to encourage the production and deployment of electric vehicles? How could industry better support these efforts?

It needs to be a joint effort between politics and industry. Our feeling is that industry is now shifting development efforts in the direction of electromobility. Presumably they feel that this is the drive technology of the future, certainly with at least a transition phase that still involves internal combustion engines. Alongside this, a number of other activities are taking place – automation and connectivity, for example – and we are seeing new players coming from Silicon Valley, Tesla and other places who are really shaking up the established industry.

Our expectations, or at least my personal expectations, have always been that real market share by electric vehicles will only be reached once the boundary conditions have changed significantly. By this I mean no longer allowing people to enter city centres in a combustion engine vehicle or making such cars more expensive, either through fuel price or tax. There has been such a change in those boundary conditions already, but it was not triggered by politics itself.

How important is public acceptance when it comes to the success of electric vehicles?

Europe will only be successful at implementing new vehicles and fulfilling the mobility demand, which is of course the main task, if you meet the requirements and win the approval of the customers. We need to make sure that we understand the needs and we need to look at all the technical possibilities. IKA of course likes to bring up new vehicle concepts which are based not on a pure evolution of existing

Special parking rights for drivers of electric vehicles could help motivate their uptake



© Luke McKernan

models and vehicles but on a more revolutionary approach, which we have recently demonstrated on our research platform SpeedE (www.speede.de). By that I mean development from scratch, following the 'design thinking' approach which starts with the product experience in the very beginning and then looks to combine functionalities in, for example, an electric vehicle that are difficult if not impossible to achieve with a conventional vehicle. That way we can show that there are more advantages to electric vehicles than just being locally pollution free; you have, for example, the option of being much more agile, being able to manoeuvre better in cities, and being able to create an entirely new drive experience. This is the direction we are focusing on as researchers.

In addition to electric vehicles, there is also a push towards fuel cell and hydrogen technologies. How would you assess the green vehicle landscape in Europe looking ahead to 2020 and beyond?

I think we are heading in the right direction. We need to take these 'green' steps if we are to be able to still provide individual mobility in the next decade. We need to use the challenges that are there, but, on top of that, it will be important to concentrate not just on transforming combustion engine drives into electric drives but also on seeing what else we can do for the customer.

Hydrogen involves many of the same challenges as electromobility. There are still technical aspects to be considered with the fuel cells and there is again a big issue with the distribution network. Electricity is at least available in a very dense grid, whereas hydrogen is not. On the other hand, the energy density is much higher in a hydrogen fuel tank than it is in a battery, but still you need a distribution network, which just doesn't exist at all. So again you are left with this chicken and egg problem.

**Micha Lesemann, Dipl.-Ing
Chief Engineer
Institute for Automotive Engineering
RWTH Aachen University**

www.ika.rwth-aachen.de/

Jan Nylander of the Swedish region of Gävleborg outlines a new innovative electromobility initiative that is full of promise

E-highway future

Today, there are industrial demands on increased transport capacity and a push to reduce pollution caused by this transportation. In Sweden there are political demands and promises as regards achieving fossil fuel-free transportation, with targets around the 2030 and 2050 timeframes. Meanwhile, there are clear public demands as regards pollution and transport-related noise, as well as the need to raise employment and improve quality of life. There are local, regional, national and European demands along the same lines. The issue today is not so much the goals or positive effects, or even what should be done, rather how it should be done.

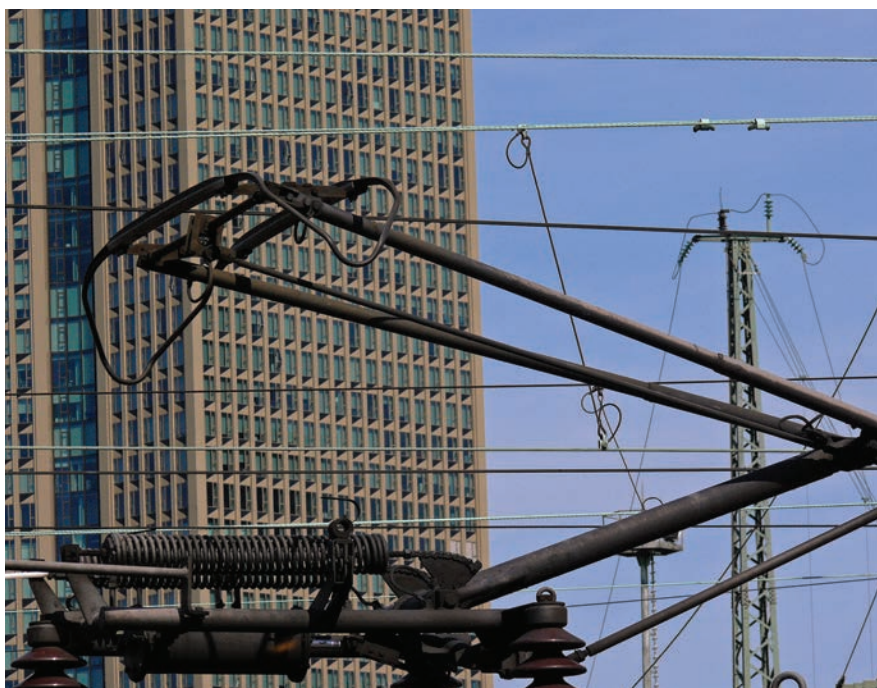
Technology demonstrators are powerful processes where results from implemented techniques, methods and the gathering of real use data can result in trustworthy information that enables decisions on how wider implementation can actually happen.

Demonstrators are also risk-minimising platforms for industry, academia, suppliers, users and other actors to develop innovative interdisciplinary businesses and solutions that can further enhance the future benefits of climate-smart logistics on a broader scale.

Governance issues and demonstrators

One challenge of combining industrial and official co-operation, where results may be the basis for future public procurement, is state subsidy

Pantograph technology is well proven



regulations. Even though actions are often labelled 'pre-commercial' and 'non-competitive' when it comes to conflicts of interest, patent and licence issues, implementation can result in the establishment of *de facto* standards. Other impacts from demonstrators that are managed and partly owned by industry might hamper the future procurement process, thereby preventing good solutions from being implemented in reality and their benefits from being gained.

An operative demonstrator based on a public private partnership (PPP), owned and managed by a public organisation and not being a part of the commercial business, offers a neutral ground, prevents conflicts of interest and enhances the quality of the resulting platform for future decisions. Public organisations often suffer from a lack of experience, management and quality staff, and therefore won't undertake this work. All weaknesses can be seen as an opportunity, and this project shows what can be done.

It is therefore important to look at what has been done, and how it can affect the development and implementation of infrastructure for climate-smart heavy logistics. But it is equally important to learn from how the project was carried out, since the result of any demonstration will feed into future joint undertakings.

Moving to demonstrate

Region Gävleborg, the eastern part of mid-Sweden, consists of ten municipalities and is a public organisation responsible for governing the region. Region Gävleborg has approximately 6,500 employees and is, among other things, responsible for enhancing the possibilities for industrial growth and innovation, as well as fostering the regional attitudes and climate necessary to drive growth and quality of life.



In this context infrastructure and public transport, as well as sustainable business development and education, combined nicely when the organisational platform for the world's first demonstrations of e-highways on public roads were launched.

The Elvåg E16 project started when the Swedish national road and rail administration launched a process for the innovation procurement of infrastructure for climate-smart transportation and the PPP was established in the region. Parts of the PPP come from industry (the majority of the large transport customers in mid-Sweden), academia and public actors. Overall, the PPP is owned and managed by Region Gävleborg.

Starting with 11 consortia members and PPPs of different kinds, a step-by-step decision making process that resulted in a decision in June 2015 to co-fund this e-highway project. The Elvåg E16 project received €8.2m in public grants and €4.7m in industrial co-funding for the demonstrator. Having been opened on 22

There is increasing consensus amongst policy makers that road transport needs to be decarbonised

June 2016 by two government ministers and two director generals, the project will continue until spring 2018.

Details matter

The system chosen is a Siemens e-highway system. It is a two-pole catenary, where the components have been proven in railroad and tram systems over many years. Even though the concept with two parallel wires is new, the components used are not. It is a very stable system, with limited conflict of interest if implemented on public roads. The technology is well known and all intellectual property rights related to the infrastructure have ceased to be valid. The concept of two wires, with a standard distance and height over the road surface, thereby presents great potential in being established as a wider e-mobility standard without hampering future procurement processes.

It is a medium voltage system, 750V DC, the same used today for trams in cities. The switchgear, transformers and so forth are all standard components, with suppliers being sourced across the commercial market.

The poles are mounted outside the road and the wires are over the free-height, thereby establishing the complete system outside the legal traffic area of roads. This means the actual security and maintenance of the infrastructure is expected to be straightforward.

The truck used in the Elvåg E16 project is a standard parallel hybrid truck from Scania. It is in production and has a contract for external electrical supply and interaction with an external mounted device. Several solutions



A view of the Elvåg E16 highway

can be combined with the Scania. We recognise that it is important to have as a partner a truck manufacturer who already has experience of deploying certified and approved hybrid trucks on public roads.

So far all the components, suppliers and devices have no restrictions when it comes to patents or other legal limitations for future public procurement.

The pantograph (the equipment mounted on the truck connecting the two-pole catenary system with the truck) has been developed by Siemens in co-operation with Scania. This solution has some patents relating to specific details in the system we have deployed. However, as a concept the pantograph is well known amongst manufacturers in the transport sector, and we hope it will be an area for innovation and development over the years to come. The pantograph used in our demonstrator works well, and we do not see any restrictions or problems for future implementation. It might even be that a third party develops the best pantograph and that design is bundled with trucks under a distribution licence, similar to the early days of mobile phones.

Region Gävleborg owns and manages the project, Siemens provides the infrastructure, and Scania provides the trucks.

Several issues have been resolved in innovative ways, which has helped to ensure the implementation of this innovative technology that has never been used before. The experience and engagement of industrial and public staff, from many organisations, has resulted in excellent work here. We have now established known technology on a public road, for the first time, and during the start-up phase we focused on what legal or policy modifications had to be done, could they be done, which restrictions had to be used and so forth. We are therefore very proud to state that no restrictions were needed. The project has established the infrastructure and will drive and test the trucks, systems, methods, processes and other issues we did not anticipate.

We are achieving this today, on a public road, without any restrictions or modifications of policies, legal frameworks or other technical standards. Thus, the demands on a publicly owned and managed PPP have been fulfilled and the project can contribute towards meeting the challenges around clean transport.

Next steps

The demonstrator will now be used for testing until spring 2018. We have also constructed a visitor centre at Sandbacka Park, a science park in Sandviken, Sweden. Many have already booked visits, and we look forward to showing off the facilities and demonstrator and engaging with the public and stakeholders about how we work. Further, step-by-step, we are aiming to establish a European network for implementing experiences, technology and solutions enabling a real shift towards climate-smart heavy logistics, helping meet the demand for fossil fuel-free transportation.

The regional goal is to achieve a shift towards climate-smart transportation while supporting employment, industrial growth, investments and quality of life. The benefits are primarily supported by use (low cost, no pollution) and the export industry (regional companies learn how to build and maintain the electric road); the public meanwhile benefits from low noise, reduced pollution, and increased investment and industrial growth. All of these combine as a force fostering sustainable human mobility in the region.

Region Gävleborg has now joined with Region Dalarna in this project, and we are co-operating with the authorities in neighbouring Norway to make the E16 a two-country demonstration for electrified road infrastructure. The ambition is to allow users and companies to benefit from lower transportation costs and drastically reduce emissions, thereby enhancing industrial growth and fostering a global competitive advantage while vanishing the environmental impact. The experience and technology development by itself also has export potential, providing products, services and new PPP experiences.

We look forward to welcoming everybody who wants to see what we have done, and to talk about how we did it in order to make it happen in many places in the future.

Jan Nylander
Region Gävleborg

www.regiongavleborg.se

Pan European
Networks

DMR

DEFENCE MANAGEMENT REVIEW

MILITARY • CYBERSECURITY • COUNTER-TERRORISM



A new publication

AUGUST 2016

UK tel: +44 (0)1260 273 802
Brussels tel: +32 (0)249 403 57
email: info@paneuropeannetworks.com

www.paneuropeannetworks.com

The Fleet Operator Recognition Scheme (FORS) aims to be the UK's industry standard for safe, efficient and environmentally sound fleet management services, as PEN discovers

Fantastic FORS

The Fleet Operator Recognition Scheme (FORS) is a voluntary accreditation scheme which allows employers to monitor the safety and efficiency of their fleets, including vans, lorries, minibuses, coaches and other vehicles. The scheme identifies key areas of fleet operator services which can be improved to the benefit of the overall safety and efficiency of the business, and offers accreditation to operating centres on a single, multiple and whole-fleet basis. John Hix, director of the FORS Community Partnership, outlined the organisation's aims in its annual report for 2015: "Our vision is to enable all fleet operators to attain and maintain the best possible level of productivity and efficiency with the least impact on society and the environment and to facilitate continuous improvements in operating standards."

FORS was established in 2008 by Transport for London (TfL) and transferred to an independent community partnership with a remit to expand beyond London to the rest of the UK. According to the organisation's annual report for 2015, in its first full year of independent operation FORS saw a 32% increase in accredited organisations, and is continuing to expand. Some 865 companies were either newly accredited or achieved a higher accreditation in 2015, showing that the organisation has started to grow quickly since it gained its independence.

Hix explained the significance of the scheme's expansion in its first full year of operation: "The impressive growth of our membership is a demonstration of the industry's continuing support for FORS as a force for good which constitutes the set of standards to embrace. We are also immensely encouraged by the continuing support from our members and organisations specifying FORS as a prerequisite for fleet operators wishing to join their supply chain."



© Highways England

FORS intends to improve road safety and become an industry standard for safe and efficient fleet vehicle management

FORS accreditation

FORS offers three levels of accreditation which can be granted to fleet operators: bronze, silver and gold. Bronze is the entry level accreditation and reflects an operator which follows good practice and is compliant with the fundamentals of the FORS standard. It is achieved through an initial audit, after which some operators are subject to action points that must be addressed prior to certification. Silver accreditation is offered to operators which have made additional commitments to safety, efficiency and environmental protections, and completed further training; this is awarded after evidence is submitted and analysed by a FORS administrator. Gold accreditation represents an exceptional operator that has demonstrated its ability to meet key targets and has proven its dedication to constant improvement; once again, this is awarded after evidence to support the application has been submitted and approved.

HGVs are among the fleet vehicles covered by FORS



© Glen Wallace

Among the features of the scheme is a toolkit that helps to monitor penalty charge notices against fleet operators, which FORS says will reduce the amount of fines businesses are forced to pay. Additionally, the system includes fuel calculators that help to track fuel use and improve efficiency, and requires

cycling awareness training to achieve the highest accreditation.

Improving safety

The primary interest of FORS is to improve road safety, and in an effort to reward the effective implementation of safety practices, the organisation has partnered with British road safety charity Brake to sponsor the Fleet Safety Awards, an event that looks to celebrate the work of individuals and companies which have worked to improve UK road safety.

FORS's operations director, Anne Johnson, said that the organisation and the charity share a common goal: "The management of work-related road safety is at the heart of the FORS standard, and as such we stand four-square with Brake. FORS members are working hard to reduce collisions in their own fleets and throughout their supply chains, and we look forward to celebrating everybody's great achievements at the awards."

Industry standard

One of the focuses of FORS is to establish a single industry standard that can be used around the UK, and possibly Europe, as a barometer of quality by all industries and sectors dealing with fleet management operators.

Hix discussed the need for a single set of standards to improve operating procedures among UK companies in order to streamline efforts to make them safer and more efficient: "Authorities and transport buyers across the UK can now ensure that their supply chain will operate industry's best practices at every level, raising the standards of their operation beyond the minimum statutory requirement. FORS also provides the industry with an opportunity to unite around a single set of best-practice standards, therefore cutting through the potential multiplicity of operating standards."

Steve Agg, chairman of the FORS Governance and Standards Advisory Group, expanded on this aim, expressing his hope that the scheme will be adopted as the industry standard in the UK and beyond: "The ultimate target for FORS is to be adopted as the single national standard of safe and efficient operation by the UK transport sector. A robust and respected standard that is universally recognised by both vehicle operators and those that contract them



Cyclists are particularly vulnerable, with 75% of accidents occurring in urban areas

to the benefit of both the UK industry and economy and of all fellow road users."

Expanding FORS

In performing audits on companies wishing to achieve a bronze accreditation, FORS found that some 55% of companies were able to achieve the award based on their current operating standards, while a further quarter were issued with certificates subject to improvements being made and a second audit being undertaken. Given the large sample size, this suggests that only around half of UK businesses are currently operating at the level proposed by the scheme, meaning that the scheme has scope for further expansion.

In particular, FORS has a number of programmes and tools to protect vulnerable road users. According to statistics from the Royal Society for the Prevention of Accidents (RoSPA), in 2014 there were some 21,287 road accidents involving cyclists in the UK, including 113 in which cyclists were killed and more than 3,400 where cyclists were seriously injured. RoSPA reports that 73% of all reported accidents in 2014 were due to human error, whether on the part of the driver or the cyclist, and around 75% occurred in urban areas. Increasing drivers' awareness of cyclists, and ensuring that cyclists are aware of driver blind spots and other elements that put them at risk, is necessary to reduce this number of accidents.

To achieve this end, FORS offers TfL-funded safe driving courses for drivers operating HGVs and public service vehicles in urban areas with a high number of vulnerable road users, such as cyclists and pedestrians. The courses have been delivered to more than 11,500 drivers around the UK, which demonstrates the growing scope of the FORS programme beyond its standard fleet operator services. FORS has begun expanding into Europe with a team of seven international auditors representing 13 European countries, and performed 16 audits for bronze accreditation across the continent in 2015.

SCC Marketing Ltd's Paul Stewart discusses vehicle powerline communication technology, which is helping to improve road safety

VPC: supporting safer roads

The past decade or so has seen a real push towards safety in the world of commercial vehicles, and rightly so. In London, UK, between 2008 and 2013, vehicles over 3.5 tonnes were responsible for 55% of cycling fatalities and twice as many involving pedestrians and motorcyclists. Despite this, these vehicles represent just 4% of road miles travelled in the capital.

Some organisations do exist, such as FORS and CLOCS, which are already doing excellent work in this area, driving up standards and making vehicles safer for vulnerable road users. Unfortunately, a number of barriers still exist, none perhaps more so than the monetary cost of the technology necessary to make vehicles compliant. Not only is the high cost of this equipment viewed as prohibitive, but the time vehicles must spend off the road to have it all installed – a full day and sometimes longer in many cases – results in further costs being incurred by operators due to the loss of income when a vehicle isn't in operation. This, coupled with a degree of uncertainty as to what equipment is actually needed to make a vehicle fully compliant, is steering many operators away from organisations like FORS and CLOCS at a time when the industry should be embracing them.

Various attempts have been made in recent years to meet the safety needs of the industry and a number of interesting technologies have resulted from this. Camera systems are now available that stitch together several different images to offer a 360° view around a vehicle, a system can be fitted to side underrun bars that deploys an airbag when vehicles are operating in built-up areas to prevent people from falling beneath them, and there are even cameras that utilise analytics to detect moving objects as opposed to stationary ones. However, whilst these technologies have been designed to drive up safety standards in the industry, they are still seen as expensive by many operators, meaning take-up has been far from widespread.

Overcoming cost

One exciting piece of new technology that could go some way towards overcoming this is VPC – vehicle powerline communication. It allows proximity sensors to communicate with an in-cab display by sending a coded signal through the vehicle's existing wiring loom, not only overcoming the need to run cables from the rear to the front of a vehicle, saving hours on installation time, but also allowing any tractor unit with a display to be used with any trailer fitted with a rear blind spot detection system, resulting in universal fleet compatibility. The VPC system knows when the trailer is attached and automatically pairs with the in-cab

display, instantly offering full rear blind spot protection, without any driver input. Even outside contractors and hire vehicles can connect to the systems by using an in-cab plug-in display module.

Whilst this technology is not yet available for camera systems, it does mean cameras and proximity sensors can easily communicate, allowing for various modifications to be made to the systems. For example, whilst cameras are seen to be important in making vehicles safer, in-cab monitors can often end up being a distraction to drivers, and if they are constantly on there is nothing to actually indicate to a driver just when they should be watching the screen. With VPC, the monitor can be configured so that it will only come on when the sensors detect something; otherwise the screen is blank and so not a distraction, which is a huge leap forward in camera safety.

The important work FORS, CLOCS and other organisations like them are doing is far from over, meaning it is vital that the industry, and its suppliers, does all it can to meet any new challenges head on. As the technologies mentioned in this article demonstrate, real progress is being made in driving up safety standards in the industry, but it is important that these are fair to operators and their budgets. This approach is certainly the right way forward for the industry, and hopefully we will start to see more innovations like this in the future.

Paul Stewart
Marketing Manager
SCC Marketing Ltd



The Home of VPC

New technology saves time and money

With annual damage repair costs of £4,000-6,000 (~€4,805-7,208) per truck, transport managers and fleet engineers are familiar with the costs and pressures of maintaining a successful fleet. Remaining profitable and meeting new legislation makes it increasingly difficult to protect your fleet whilst keeping your budgets under control.

Xvision Advanced Safety Systems are the most cost effective on the market; even in the first year Xvision will save you money, making your vehicles fully compliant whilst minimising the time they'll be off the road. Our unique VPC technology means our systems are universally compatible across whole fleets with no driver input, including articulated vehicles and drawbar combinations, something no other company can offer.

- Front corner step and cycle protection;
- Complete rear protection;
- Complete side protection;
- Front corner blindspot camera;
- 360° camera system;
- White noise alarm;
- Left turn alarm; and
- Dash cam.

Steve Atkinson

SCC Marketing Ltd

+44 (0)845 2700 862 (Option 1)

steve.atkinson@xvisionsystems.com

www.xvisioncommercial.com



Christophe Tytgat, secretary general of SEA Europe, answers PEN's questions on the maritime technology industry

A blue horizon

While the maritime sector may be essential to the effective functioning of the European and global economy – transporting goods and people – it is clear that the sector faces multiple challenges today. From ensuring competitiveness to addressing environmental concerns, leaders in the sector are having to adapt to a changing world.

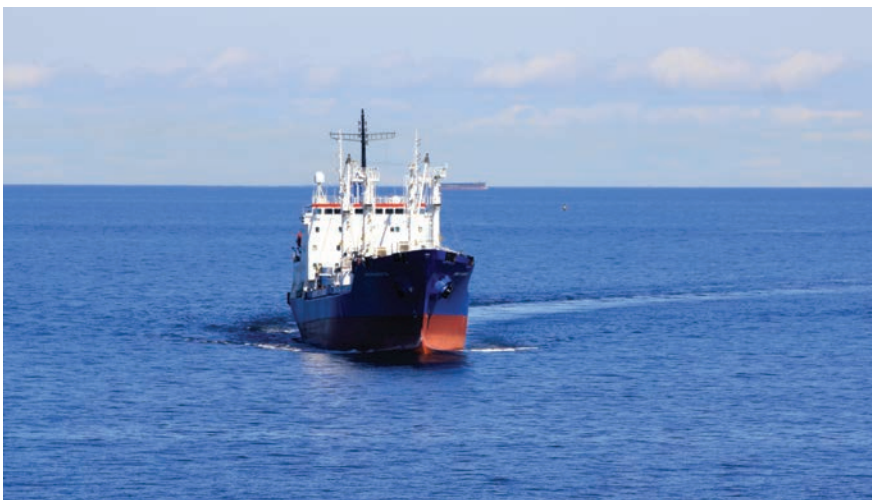
At the European level, SEA Europe, the European Ships and Maritime Equipment Association, works to represent and champion the maritime technology industry, supporting the companies working in the arena while engaging with the EU institutions.

In March this year, Christophe Tytgat was appointed secretary general of the association. In this broad ranging interview, Tytgat outlines his core priorities and reflects on key issues such as environmental matters and the economic development of the sector.

As you take the helm at SEA Europe, what are your key priorities for the coming months?

Following my appointment, SEA Europe has decided to revise its strategy so as to better identify its priorities, purpose and mission. This exercise has taken some time but was finalised at the General Assembly in June. Following approval of the revised strategy, I will have to implement it on all fronts. This has been my first priority and will remain so for some time.

My second priority is the need to increase the visibility of SEA Europe towards EU decision makers and stakeholders in Brussels. This will involve arranging meetings with the various commission services, cabinets and commissioners as well as with the member states and members of the European Parliament. There is also a need to enhance dialogue with our colleagues across the maritime industry sector.



Furthermore, as the new secretary general, I will also travel around the EU to meet our association members.

Finally, I have to learn a lot of new files and issues. Although I come from the maritime industry, with a professional experience of almost 15 years at the European Community Shipowners' Associations (ECSA), SEA Europe offers a completely new challenge with many technical issues on the agenda.

How would you assess the level of dialogue between the industry and EU institutions at present – do you feel your position is being adequately engaged with at the EU level?

The level of a dialogue with the EU institutions has been relatively good in certain areas, but there is room for improvement in others.

On social matters, SEA Europe has played an active role as a recognised social partner in the Sectoral Social Dialogue Committee for shipbuilding, together with its trade union counterpart IndustriALL. Through this dialogue, SEA Europe has established good contacts with the relevant commission services, including DG EMPL and DG GROW.

Also on trade issues, SEA Europe – together with its member associations – has been actively engaging with the European institutions and stakeholders. The Transatlantic Trade and Investment Partnership has been one example. Competition issues with South Korea have been another topic of dialogue with the commission services.

On defence matters, SEA Europe has been less active so far, but there seems to be a keen willingness to become more active with regards to the European Commission and the European Defence Agency.

We are now gradually building up a closer relationship with other commission services such as DG MOVE and DG MARE.

Contacts with maritime stakeholders can definitely be improved. But this is not just an issue for SEA Europe. It applies to the wider maritime community. In my view, most of the contacts to date have either been *ad hoc* or driven by personal relationships. This should change and I truly believe that a structured dialogue – like we had during the days of the Maritime Industries Forum – would improve dialogue between the maritime industry players.

What role do you see yourselves playing at SEA Europe when it comes to improving environmental performance in the maritime sector?

In my opinion, there are two steps. Firstly, there is a clear need to spell out the various initiatives and/or tools that already exist or that are in the pipeline to help the maritime industry in meeting its obligations under existing – international and/or European – legislation. I have the impression that – despite the many discussions on environment-related topics over the past five to ten years – there is still a lack of awareness as to what exists or is possible or achievable.

I know that policy makers have many expectations from the industry, but sometimes they may have the wrong impression that the maritime industry is falling behind in terms of environmental performance. I do not think that is a correct perception, and there is definitely a role for the maritime industry, including SEA Europe, to spell out more clearly what the industry has done or is doing.

Secondly, there are ongoing discussions on CO₂ emissions. Since the shipping industry is a global industry, there is a need for global rules, and in this respect the International Maritime Organization has to play its role. But these discussions take time and are difficult: the issue is complex and a ‘one size fits all’ approach isn’t necessarily possible, despite what may be thought sometimes. Having said this, SEA Europe’s members are working very hard to make sure that ships will be built, adapted and equipped to meet those standards that are required to improve the maritime industry’s environmental performance.

My role in all this is to make sure that policy makers are aware of the possibilities, opportunities and feasibility of the maritime industry in general and my members in particular are responding. But the shipping industry also needs to be aware of this. To that

end, I will engage in a closer dialogue with the EU institutions and maritime industry players.

When it comes to naval matters, what are your key priority issues in terms of engaging with the defence sector and European navies?

As I said before, so far, SEA Europe has been less active in naval matters, but there is a clear wish to become more active in future. In particular we are engaged with the various initiatives that the European Commission or European Defence Agency continue to propose.

What are the primary economic challenges facing the sector today (such as investment or skills), and what role could the EU play in confronting these?

SEA Europe’s members indeed face important challenges, but these challenges also create interesting opportunities.

Our industry’s challenges and threats have been clearly described under the LeaderSHIP 2020 strategy, which was endorsed by the Council of the European Union in May 2013. Further, the recently issued European Skills Council’s report, made jointly by SEA Europe and trade union IndustriALL, contains interesting information on challenges and opportunities.

LeaderSHIP 2020 contains a set of recommendations to bring about necessary sectoral changes and to create a fully competitive and sustainable industry. These areas for action are as follows:

Employment and skills: one recommendation is that industry and the European Commission should undertake a skills mapping exercise and provide input to available EU programmes and projects to improve skills and competences. This exercise was carried out over the past three years and resulted, *inter alia*, in the joint SEA Europe/IndustriALL study on a European skills council for the maritime technology sector. This study should help the facilitation of future skills, training and mobility.

Improving market access and fair market conditions: a global level playing field, open markets and non-distortion of trade and competition rules are vital for the interest of the EU and its maritime technology sector.

Ease the access to finance: after the financial and economic crisis, funds for new projects have become scarce and expensive, *inter alia*, because banks have reduced their exposure to the European maritime industry or terminated ship financing altogether. Access to finance has become the single most important factor for international shipbuilding contracts.

Research, development and innovation: the competitiveness of the European maritime technology industry relies on its capacity for strong RDI. In the future, RDI will also be a key tool to enable the European maritime technology industry to be in the technological lead and to remain competitive in a global market.

Christophe Tytgat
Secretary General
SEA Europe

www.seaeurope.eu

Transport & Environment's Sotiris Raptis considers how an EU fund could curb shipping emissions and support efficiency improvements

Sailing towards clean shipping?

Under the Paris Agreement, for the first time, all countries agreed to limit the global temperature increase to well below 2°C and, furthermore, to pursue efforts to limit it to 1.5°C. Having escaped explicit mention in the deal, emissions from shipping are still the elephant in the room and will jeopardise the efforts of other sectors. Unless action is taken, at both international and EU level, it will be all but impossible to keep global warming well below 2°C.

The reform of the EU climate law is a crucial opportunity for Europe to lead the way and maintain its position as front-runner towards developing a sustainable economy. Taking timely economy-wide action through the inclusion of shipping emissions in the EU's 2030 reduction target would be one of the most straightforward ways to widen the reach of EU law and increase the EU's post-Paris ambition. The establishment of a flag-neutral maritime fund under the European Trading Scheme (ETS) directive is the most preferable policy option at EU level to reduce shipping emissions and contribute to mitigating climate change without creating competitive distortions.

IMO action

As a matter of principle, measures agreed at the international level are preferred. However, shipping's only legally binding climate measure is not stimulating the uptake of new technologies or driving efficiency improvements, according to independent studies. Since 2013 newly built ships subject to the International Maritime Organization's design fuel efficiency standard – known as the EEDI – have performed much the same as those not covered. The IMO started working on the reduction of greenhouse gases in 1997 when the Kyoto Protocol was agreed, but has failed ever since to grasp the nettle and deliver any meaningful

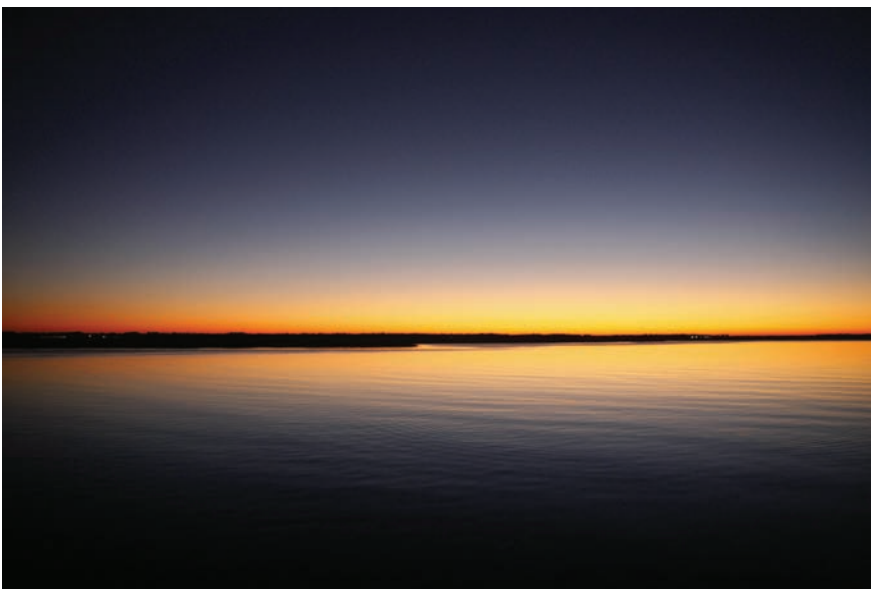
measures to reduce emissions in the sector. In fact, the IMO has been struggling to reach an agreement, lagging behind the EU with regard to the emissions reporting system (MRV).

In a similar vein, the organisation, in its first after-Paris meeting of the Marine Environment Protection Committee (MEPC 69) last April, didn't reach an agreement on a work plan to develop a reduction target for maritime emissions in line with the Paris Agreement. In the meantime, emissions from international maritime transport have increased by 70% since 1990. Compared to country emissions, the global maritime transport sector ranks between Germany and Japan. Furthermore, shipping emissions are projected to increase by 50% to reach 250% by 2050, which could then represent up to 17% of total emissions globally.

This projected development is not consistent with the post-COP21 target of limiting global temperature increase to well below 2°C. The scale of the discrepancy between targets commensurate with global climate change objectives and the industry's projected emissions scenarios is so large that shipping is urgently required to cap its emissions and start reducing them as soon as possible.

EU steps in

Flag-neutral measures at EU level could significantly reduce CO₂ emissions from global maritime transport. CO₂ emissions related to journeys from and to EU ports represented around one-fifth of global maritime emissions, according to the European Commission's impact assessment on shipping emissions (2013). Furthermore, the inclusion of shipping in the EU's 2030 climate target could increase the pressure and incentivise the launching of a process at international level. Shipping is currently the only transport sector not contributing to the EU climate target. According to the impact assessment, EU-related CO₂ emissions are projected to have increased by 54% in 2030 and by 86% by 2050 compared to 1990 levels.





Following on from the Paris Agreement, commitments to fight climate change must be scaled up at a global level as well as in Europe. The EU has both the obligation and capacity to honour the Paris Agreement and its objectives. In order to reach the full potential of abating emissions in a cost-effective way, all sectors of the European economy must participate, in line with the 'polluter pays' principle.

A flag-neutral maritime climate fund should be set up under the ETS directive with the specific task of reducing CO₂ ship emissions. The fund would contribute to the EU's 2030 climate target by surrendering EU allowances (EUAs) purchased on behalf of ship operators using member fund contributions. It would also support energy efficiency improvements and facilitate investments in innovative technologies to reduce the sector's CO₂ emissions through ship abatement measures partly financed by the fund. This fund would be a carbon pricing mechanism having the EU ETS price as a floor price per tonne of CO₂. This is consistent with the Organisation for Economic Co-operation and Development (OECD) and International Monetary Fund (IMF) proposals for a carbon price for shipping ranging from USD 25-30 (~€22-27) per tonne of CO₂.

In principle, ship operators would be subject to the ETS rules and have to surrender allowances.

Operators would, however, also be able to opt out and pay a membership fee to the fund based on their level of reported emissions in the previous year via the MRV regulation, which the fund would then use to purchase EUAs on behalf of its members. The total quantity of allowances purchased each year would be equal to the total quantity of allowances that fund members would otherwise be required to surrender individually under the ETS. The fund would have to carry out all the necessary administrative work with regard to the purchase and surrender of the EUAs.

In order to promote investments in emission-reducing projects/technologies in the shipping sector, the fund would provide for a flow-back mechanism financed through a fixed percentage of member state revenues from the allowances purchased. The shipping industry, including short sea shipping, ports, as well as environmentally friendly port charging schemes, would be financed by the fund to improve energy efficiency.

Taking timely economy-wide action respecting the no-more-favourable-treatment and non-discrimination principles (flag-neutral) would *de facto* increase climate ambition in Europe and contribute to aligning the EU's 2030 climate target with the Paris objectives. There is no reasonable excuse to continue exempting the sector from the global and EU climate policies. That shipping needs to make its fair share of cuts to keep global warming well below 2°C is not negotiable after Paris.

Sotiris Raptis
Shipping Officer at Sustainable Transport Group
Transport & Environment

www.transportenvironment.org

Out of the blue comes green

‘Blue is the new green’ sums up the ongoing development of Norway’s world-leading maritime industry. NCE Maritime CleanTech focuses on clean maritime solutions

From the west coast of Norway, geographically concentrated in the region between Bergen and Stavanger, NCE Maritime CleanTech (NCE MCT) represents one of the world’s most complete maritime commercial hubs. The cluster organisation uses the Norwegian maritime expertise, built up over generations, as a springboard for the development of new energy-efficient and environmentally friendly technologies.

The work of NCE MCT has already resulted in, for example, the world’s first battery driven ferry, the *Ampere*. Today it operates a passenger ferry route crossing the Sognefjord in Norway. This is a direct result of the work within NCE MCT to strengthen different participants’ competitiveness, by developing and launching innovative solutions for clean maritime activities.

Over 50 co-operating companies and organisations

NCE MCT has 55 partners in the cluster who cover every stage of the maritime value chain: from design and engineering companies, yards, equipment and service providers, shipping companies; to research, development, education (R&DE), training centres, suppliers of renewable energy, and companies from the marine industry.

The different cluster partners are also of different sizes: from small and medium-sized enterprises (SMEs), to large, international companies like Wärtsilä (learn more about their work on page 154). There are also several competitors that co-operate through the cluster, e.g. offshore shipping companies like Eidesvik, Solstad and Østensjø.

‘NCE’ is an acronym for Norwegian Centre of Expertise. This means that the NCE MCT is a member of a government supported cluster programme. NCE MCT interacts closely with other maritime clusters both in Norway and the EU, in addition to clusters within the oil and gas industry, seafood clusters and clusters working with production technology, big data and smart grid solutions.



The Short Sea Pioneer. All design rights: NCE Maritime CleanTech

Clean maritime business

The market for environmentally friendly technology is in many segments immature and the industry is facing several market barriers. The regulators are introducing stricter controls to reduce SO_x, NO_x and particulate emissions in order to limit air pollution. In addition, there is more public awareness of climate change and increased public expectation that global CO₂ emissions should be reduced.

Still the maritime industry faces many market barriers like regulations, lack of finance, lack of infrastructure for new fuels and also more institutional barriers where decision makers and the contractual regime in the industry only consider investment costs and not operational costs. Influencing policy makers setting the regulations and also defining the public purchasing criteria will lead to increased demand for clean maritime solutions.

Projects for a green maritime future

To strengthen the cluster partners’ competitiveness, the main strategy is to increase innovation. This is done through establishing joint innovation and demonstration projects where new technologies and solutions are introduced, and where the partners bring in their different expertise. For each project NCE MCT makes a consortium agreement defining each partner’s intellectual property.

The following are some examples of innovation projects with electric and hybrid solutions.

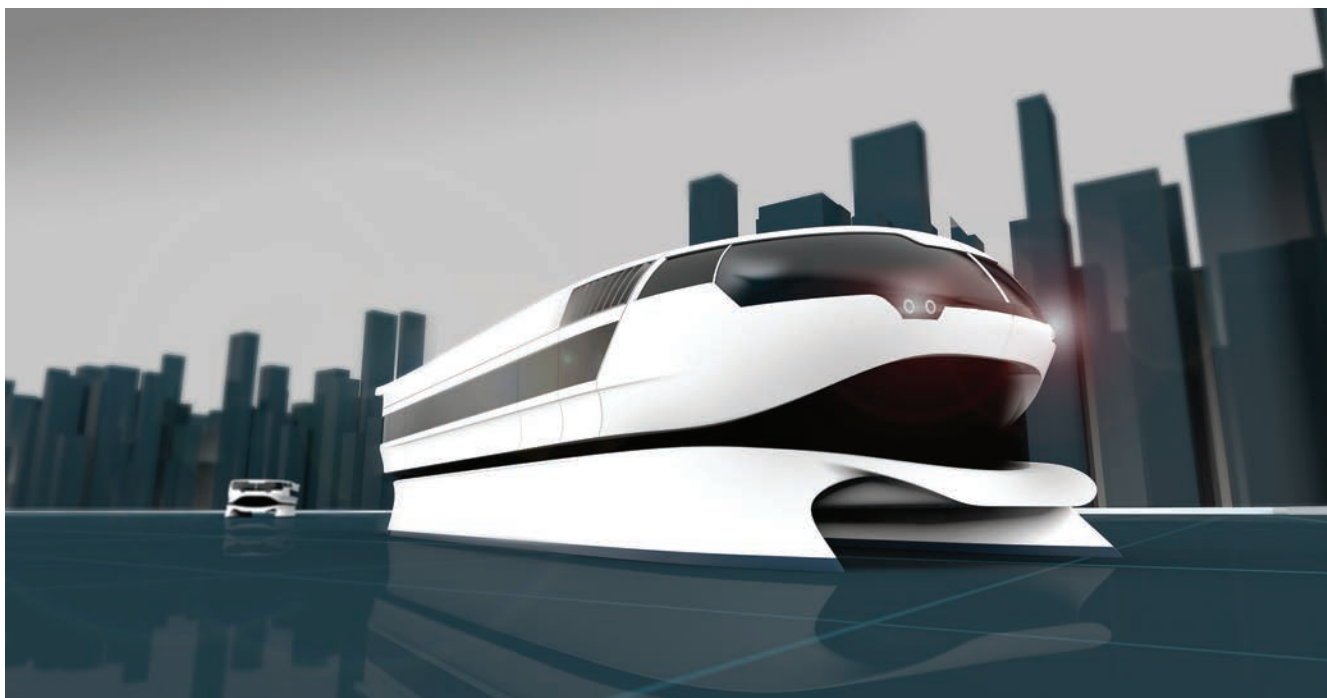
Zero emission ferries

As mentioned above, the *Ampere* ferry is the world’s first battery driven ferry. Ferries are suitable for electrification due to their predictable routes and loads, established patterns and data (weather, tidal and current information). *Ampere* has now been operating its route for over a year (started March 2015), and fuel cost has been reduced by 60-70%. The batteries are charged with the use of renewable hydropower from the onshore grid. This on-board battery pack, like the ones on each pier, corresponds to the effect of 1,600 standard car batteries. Charging at each pier only takes ten minutes.

The *Ampere*-project has opened up a market in Norway: now all new public ferry contracts will have low or zero emission technology. Knowledge and technology are transferred from different market segments and adapted to the specific vessel’s operational profile.

Electric hybrid systems in offshore vessels

Among other NCE MCT projects are electric hybrid systems in offshore vessels, fishing vessels and also tourist boats. One



The Urban Water Shuttle. All design rights: NCE Maritime CleanTech

example is the *Viking Lady* (see page 154), another is *Edda Ferd* owned by Østensjø (battery installed for 'peak shaving'). Here it has developed a new diesel-electric propulsion system that uses less fuel and will set new environmental standards for offshore vessels. This new system will reduce NO_x and emissions of greenhouse gases, providing an even more environmentally friendly option than today's gas powered vessels.

All electric and hybrid ships with energy storage in large batteries with optimised power control can significantly reduce fuel costs, maintenance and emissions.

New concepts for green shipping

The NCE MCT cluster has also developed the concept of a zero emission, fast moving vessel called the Urban Water Shuttle. The vessel will be built in low weight and sustainable materials like aluminium and propelled using the latest hybrid technologies, a combination of fuel cells and battery power.

The project objectives are reduced urban congestion, reduced emissions and reduced city infrastructure costs. The Urban Water Shuttle could be realised in cities located close to water and waterways, rendering the concept relevant for many cities. The project fits the EU goals for zero emission and reduction of dangerous gases perfectly.

Another example of an innovative project from NCE MCT is the Short Sea Pioneer, a revolutionary two-vessel solution that may change the way we transport goods in Europe. An ageing fleet, stricter emission standards and a desire to move transport from roads to sea generates a need for new solutions for coastal transport. If successful, the concept will make ecofriendly coastal transport more competitive than road transport.

The Short Sea Pioneer consists of two ship types: mother vessels and daughter/feeder vessels. The combined use of the ships creates a logistics system that will contribute to moving cargo

from road to sea through offering regularity, flexibility and availability. The concept will lead to cost reductions and reduced emissions per cargo unit for the end client.

Innovation from co-operation

NCE MCT seeks to create stronger market pull effects through public relations and influencing stakeholders. Market demand is the most important driver for new, green technology. Market barriers need to be addressed and removed. Demonstrating technological possibilities creates notice and acceptance in the market.

Cluster co-operation increases the ability for delivering integrated solutions. Joint development projects reduce risks and increase implementation capacity for the individual companies.

Close co-operation between different players in the value chain is needed to seek the right incentives and best solutions. The cluster is, through its partnership with different private business companies, R&D institutions and representatives from the public sector, well-positioned for developing and launching new clean maritime solutions. NCE Maritime CleanTech are taking the waterway to a sustainable future.



Norwegian Centres of Expertise

**NCE Maritime
CleanTech**

Hege Økland
NCE Maritime CleanTech
+47 957 53 695

post@maritimecleantech.no
www.maritimecleantech.no

A truly 'greener' future

The Wärtsilä Corporation explains how its technologies are moving shipping towards a greener future

The global maritime industry has, for the past decade or so, been faced with two serious challenges; the need to curb operating costs and the need to comply with increasingly stringent environmental regulations. Today, these challenges are more relevant than ever and fleet owners and operators are having to make difficult decisions that affect the future of their operations.

Wärtsilä, a 180-year-old Finland-based company with global operations, has emerged as the technology leader in addressing these issues. Because of its broad scope of competences and extensive portfolio of products, systems and solutions, the company is well-positioned to take an holistic approach in developing the technologies needed to secure the future wellbeing of shipping.

For example, in combatting fuel emissions, Wärtsilä was the first company to introduce dual-fuel marine engines capable of operating on liquefied natural gas (LNG) as well as conventional diesel fuels. This is proving to be a truly viable enabler of low emission operations. Wärtsilä was also the first manufacturer in the world to be awarded a marine exhaust scrubber certificate by the classification societies Det Norske Veritas and Germanischer Lloyd. At the same time, the company's strong emphasis on fuel efficiency as a key means of lowering operating costs is highlighted by the introduction of the Wärtsilä 31 engine, which has been recognised by Guinness World Records as being the world's most efficient four-stroke diesel engine.

However, Wärtsilä's most ambitious and forward-looking efforts to make shipping both 'greener' and cost-effective are its new concepts aimed at zero emissions and fuel-free operations.



Viking Lady



Battery technology for zero emissions

Through co-operation between the company's ship design and electrical & automation offices, Wärtsilä has developed concepts focusing on high energy efficiency. The designs envision ships running entirely on battery power, or alternatively in a battery/engine hybrid configuration, with the engine preferably being fuelled by LNG or biofuel.

Battery technology has made tremendous strides during recent years, both in cost and performance. Safe and efficient energy storage for 'large-scale' usage is, therefore, increasingly viable. Just as electric and hybrid cars are becoming a viable and widely accepted choice in the automobile industry, so too is the maritime sector undergoing a period of fundamental technological change. By using a complete 'plug-in' electrical system taking energy from land-based energy sources to fulfil the ship's requirements, the total efficiency from the power supplied to the propeller will be more than 85%.

With plug-in battery operation rather than using conventional marine engines, fuel consumption is reduced by 100% and all local emissions are completely eliminated. With a battery-engine hybrid configuration, emissions can be reduced by up to 50%.

Hybrid technology already in use

Wärtsilä has already accumulated significant experience and expertise in the use of its new concepts. Some three years ago, the company announced that it would install a hybrid system for the *Viking Lady*, an offshore supply vessel working in the North and Barents seas.

Because of its operational profile, the ship's power requirements vary considerably as it can be anchored at sea, or in transit between locations, maintaining dynamic positioning operations, or docked in the harbour. Consequently, the engine load can vary between 80% down to 10%. The Wärtsilä test installation has,

therefore, been designed to run in several modes. The battery is used to reduce the engine's transient load variations and, in 'dynamic positioning mode', is used as power redundancy allowing the engine to run at its most efficient load. The new hybrid system has cut the *Viking Lady's* fuel needs by 15%, meaning that the investment will pay for itself within a few years. The company estimates that the payback time for a new vessel is approximately four years, and five to six years for a retrofit installation. On the emissions side, the *Viking Lady* may spare the atmosphere from some 1,000 tonnes of CO₂ in just one year.

Another working example is the *Folgefonn*, a car ferry owned by the Norwegian shipping company Norled. The vessel has been converted to operate in a plug-in hybrid and plug-in electrical configuration. Wärtsilä's contribution to the project was the concept development, including the inverter systems, the hybrid control, the battery package and systems, the power transfer and land-based energy storage system, as well as the integration of the onboard systems.

The ferry is now unique in terms of having all types of electrical power solutions in one vessel; it can be run as a conventional diesel-electric, as a hybrid-electric, and as a plug-in hybrid. In hybrid operation, the potential savings in fuel consumption are between 10-20% with correct sizing of the engines. As a result of both the reduced fuel consumption and the improved operational profile for the ship's combustion engines, the exhaust emissions are reduced by some 30%. In plug-in hybrid operation the fuel savings are between 20-30%, while in pure plug-in operation fuel consumption can be eliminated entirely.

Inductive charging

Wärtsilä's new wireless inductive charging system eliminates the need for physical cable connections. This is important because the successful application of battery storage systems for plug-in hybrid vessels will require the fast, safe, and reliable transfer of power from the onshore electricity supply while the ship is in port. The system enables charging of the batteries to begin immediately upon arrival of the vessel at dockside. Since coastal transportation systems, and especially ferries, typically operate on a fixed schedule with short turnaround times, existing solutions for high power electrical connections with flexible cables and mechanical contacts, impose time and availability limitations. Thus, inductive charging can provide notable time and energy savings, as well as increased safety.

Inductive, or wireless, charging uses an electromagnetic field to transfer energy between two coils. An induction coil is used to create an alternating electromagnetic field, while a second induction coil takes the power from the field and converts it back into electrical energy. To handle longer distances between the sender and receiver coils, the inductive charging system uses resonant inductive coupling.

Following extensive studies and research, Wärtsilä has been able to design control systems that allow for seamless dynamic operation, including the controlled transfer of the required power even with wide variations in the mechanical positioning of the transmitting and receiving coils. The system has been designed to



transfer a rated power of more than one megawatt within a range of 15 to 50cm between the coils. This is a significantly larger variation in relative magnetic coupling than is encountered in battery charging systems for electric road vehicles.

A 'greener' future for shipping

Inductive charging will be an important feature of future battery powered shipping solutions, and Wärtsilä is actively engaged in developing and fine tuning all the appropriate technologies.

Wärtsilä has, over the years, been a leading proponent of environmentally sustainable propulsion solutions for shipping, and has taken a leading role in developing the needed means to achieve this. Notable among the company's contributions are, of course and as mentioned earlier, the introduction of engines capable of running on liquid natural gas, ethylene and biofuels. Wärtsilä has since followed-up on this technology by increasing its viability through the development of the appropriate storage, supply and control systems. No company in the world has done more to make shipping operations cleaner.

Battery operation is the obvious next step. Apart from valuable savings in fuel costs and the consequent elimination of harmful exhaust emissions, battery operation also provides significant operational benefits by improving response time and making the power plant even more stable during operations. It is, therefore, hard to imagine tomorrow's ships without on-board batteries. As mentioned previously, hybrid systems are already in use and full-scale battery-only operations will surely follow soon. In working towards this goal, Wärtsilä has taken a highly relevant, forward-looking approach to meeting future environmental legislation and in creating a truly 'greener' future for shipping.



Wärtsilä Corporation

+358 10 709 0000

firstname.lastname@wartsila.com

<http://www.wartsila.com/>

The European marine sector is moving to push innovation through the take up of the Vessels for the Future initiative, as PEN details

Watertight approach

In common with all transport sectors, the marine industry continues to look to make fleets and services more innovative. By embracing new technologies and ensuring an innovation and excellence-driven approach towards procurement and maintenance, a sustainable, prosperous and secure future for the sector can be ensured.

A key initiative active in the area is the European Research Association, Vessels for the Future. Making up the association are 65 organisations from 15 member states. The association helps to bring together the European marine cluster, generating €270bn a year and supporting 1.5 million jobs. Meanwhile, the wider 'blue economy' in Europe supports 5.4 million jobs and represents a gross added value of close to €500bn a year. Today, acting as an association for members who are embracing marine research, the leadership of Vessels for the Future have the core mission of guaranteeing European funding on maritime research under the Horizon 2020 research programme, while pursuing the establishment of a public private partnership active in the sector. Seeking to advance development of waterborne technologies, the association is supporting research in the areas of energy management, hull-water interaction, digital waterborne transport, materials, design and production, propulsion systems and fuels, new vessels and systems concepts, safety, and a virtual vessel demonstrator.

The benefit of the demonstrator is that it can test and showcase new ship level system technologies amongst the industry at large. Such technologies will be applicable to seagoing ships and vessels for coastal trades as well as inland waterways.

European strength

Given Europe's position in producing the highest value technology-rich ships, a strong pipeline of technological ideas is essential. The investment

Shipping operators are pursuing an innovative future



in front-end R&D is critical to the delivery of significant impact when output is translated downstream into new market leading products. According to the association, the benefit of this approach is that impact in development of new equipment, ship types and systems critical to the expansion of the blue growth economy could be significantly higher than what can be expected through direct investment in manufacturing alone.

While leading edge marine research and development is taking place across multiple member states, the association is seeking to bring together the disparate activities taking place today, and promote collaboration and co-operation in the union. Such an approach will help push forward the profitability of industrial innovation. The association is confident that work will not just impact the marine sector, but the wider digital market and Energy Union.

Further, the sector sees a smart future ahead. Future smart ships operating in European waters are foreseen, helping to reduce the delays in delivery of cargo and reducing industrial and societal costs linked to marine shipping. The association has this smart shipping topic under consideration.

Growing demand, growing needs

By 2030, seaborne trade is expected to at least double, and so is the world's shipping fleet. This will bring a demand for new technologies that can reduce overall emissions and safety.

The approach taken in the initiative is one that looks to the long term, with goals for 2050 set. In the area of safer maritime transport the goals of ships that are as safe as equivalent land-based assets and achieving a safety target of reducing risk by 90% are in place.

The challenges facing the maritime sector today are largely in respect to environmental legislation. New European standards regarding SO_x and NO_x pollution need to be met, while the controls on ballast water as stipulated in the

International Maritime Organization's Ballast Water Management Convention mean that new equipment must be installed on vessels.

While aware of – and looking to contribute to – meeting the challenges of today, Vessels for the Future takes more of a forward thinking approach in designing the ships of the coming decades. Naturally, ensuring low emission or even zero emission vessels is a critical priority.

Under the 'cleaner, more efficient marine transport' heading, the initiative is aiming for: ships that are more fuel efficient and support the blue economy modal transport shift, and eco targets of CO₂ emissions reduction by 80%, NO_x and SO_x reduction by 100%, and underwater noise level reduction by 10dB. For the all-important competitive industry heading 'ship design, systems development and production leadership' and 'competitiveness targets: technology supplier productivity improvement 80%, and ship operating costs reduction 80%' are the guiding goals. Indeed, it is argued that in working towards these aims, new jobs can be created all over the sector.

Take up

From across the marine sector, there is wide take up of the initiative from universities to shipyards to systems innovators. It would appear that this research association has been well received amongst business. Europe has a high volume of exceptional researchers and organisations engaged in the marine sector. Indeed, Vessels for the Future argues that the region is the world leader in maritime research. As part of the activities of the initiative, Vessels for the Future champions the continuing investment in this research capacity. As other regions around the world continue to develop their own maritime sectors, there is a belief that Europe can play a key role in guaranteeing that the region retains its position as a research world leader.

Indeed, for other transport sectors – such as aviation, rail and road transport – there are defined European PPPs in play, and the association is championing the establishment of an equivalent for the marine sector.

Corrosion

Across the entirety of the shipping sector, maintenance remains an enduring focus area. For shipping fleets, prevention of corrosion of steel hulls is a safety critical matter. There is a continuing loss of ships at sea, bringing loss of life and the goods being transported.

Moving away from toxic antifouling paints, naturally the impact on the marine ecosystem is reduced



© Robyn Draheim/USFWS

Aware of the challenge and cost linked to corrosion in the industry, starting in the early 1990s, the International Maritime Organization Assembly requested that the Maritime Safety Committee develop requirements and measures on ship design, with the intention of preventing corrosion onboard ships.

Published in 2010, the latest version of the rules in the publication '*Prevention of Corrosion on Board Ships 1877M*' is designed to directly address the issue. Within the publication, requirements for the design, construction, operation, maintenance and survey of bulk carriers, alongside specific precautionary measures regarding specific cargoes, are detailed. A number of measures, often derived from formal safety assessment studies conducted by various member states of the IMO, helped in informing the focus the international body is placing on the matter. A key issue in the 2010 update was the issue of improved coating controls and the performance standards for protective coatings. The publication contains performance standards and guidelines pertaining to the coatings.

Not only offering performance and maintenance cost savings, innovation in hull coatings also presents potential environmental benefits. Moving away from toxic antifouling paints, naturally the impact on the marine ecosystem is reduced. Of course, the build-up of marine life on a ship hull increases drag. By more effectively preventing hull fouling, shipping can operate more efficiently, using less fuel. Moreover, longer lasting coatings mean that the frequency and cost of maintenance can be brought down.

For fleet operators, corrosion remains an enduring concern; and it impacts significantly upon the reliability of vessels, availability, life costs and budget available for replacement projects. Indeed, coatings alone can account for 20% of total upkeep costs for some vessels. The benefits of taking a fresh approach to the corrosion challenge are clear. In the military space, the US Navy started a seven-year programme designed to reduce corrosion control painting costs through incorporating a rapid-cure coatings programme. This 'Single Coat Program' has seen the development of a successful rapid cure coatings technology in the US fleet, resulting in cost savings of 25-30%.

In the marine sector, it is clearly evident that investment and innovation are reaping dividends, helping to ensure future success.

Inspections made safer

RIMS is a project and maintenance consultancy company that helps to revolutionise your maintenance strategy with smart drone and robotic solutions

Established in 2015 by David Knukkel, RIMS investigates whether dangerous or resource intensive maintenance works can be done using drones or robots. With the experience gained in domestic applications, we should seriously ask why we have not yet started to use them on a larger scale for dangerous work at great heights or in enclosed spaces.

RIMS is concentrating on two concepts:

- An automated process of inspection of enclosed spaces onboard ships by robots; and
- Visual and thermal inspection of wind turbine constructions at sea by an autonomous flying drone in a fixed docking station.

The first concept will increase the safety by no longer requiring staff or contractors to enter enclosed spaces. Accidents due to lack of oxygen or poor accessibility for inspection or measurements can be avoided. RIMS can help shipowners to develop the right technologies to create safer working conditions.

The second concept comes from the trend to build huge wind turbine parks at sea to generate green energy in the most efficient way, but makes access for inspections and maintenance considerably harder and more expensive. RIMS strongly believes that the inspection and maintenance of wind turbines can be automated to a very high degree, excluding major repairs or renewals. This will reduce the operational cost substantially and reduce the risk of accidents involving staff.

Both concepts include the possibility of having data analysed by computer vision software and interface results with asset management systems to keep the cockpit model for the asset manager.

The new technologies overlap several domains, and solutions cannot be found in a single one. The available technologies and ongoing developments are spread across various industries. Integration and application specific modifications will have to be initiated for the maritime industry.

There is already a significant overlap between the work done by existing consortia in other domains such as oil and gas and the



David Knukkel

maritime industry. These consortia are established by large companies that combine their R&D projects in areas where they do not compete, such as safety. RIMS would not only like to join these consortia to build bridges between various domains but it would also like to promote innovation through similar funding of R&D in the maritime industry.

There are still a lot of challenges to overcome in the development and implementation of new technology. However, most of them are not related to the technology itself but to factors such as:

- Scepticism about the potential of the technology; and
- Lack of financial resources due to reduced innovation budgets.

During promotion sessions many companies indicated that they had already done experiments, but most failed for various reasons, not only those related to the new technology. Projects also failed due to poor management of the project itself as well as the managing stakeholder expectations.

With the rapid pace of progress, present challenges are overcome and new ones will arise. This means:

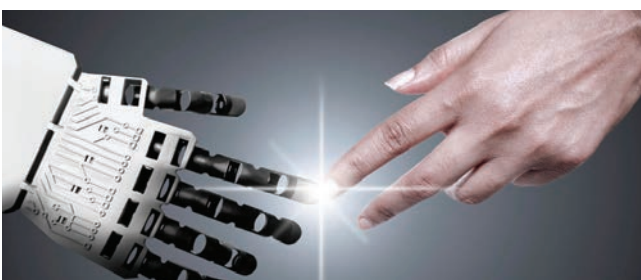
- Technology is likely to become much cheaper very quickly;
- Technology development becomes increasingly faster; and
- Cross-domain developments can be combined more easily.

RIMS acknowledges the concerns to step into this unknown area of new explorations, innovations and new fields of expertise, and can provide guidance and support through workshops and presentations using the world-leading methodology www.BusinessInnovationByDesign.com. These practical and results driven workshops give new insights in a short period with a limited budget. They eventually lead to new innovations in increased safety and sustainability whilst reducing cost in the maritime industry.

Funding through subsidies varies by country and can be a challenge for entrepreneurs.

In Holland, subsidies are provided through the Netherlands Enterprise Agency (RVO) and organisations like TKIs (Top consortiums for Knowledge and Innovation). Challengers of end users and concept integrators are not eligible for subsidy funding as funds are only available for those who actually produce the technology.

A further challenge is the requirement that launching customers have to participate in the investments. Although this makes a lot of sense, the present situation in the maritime industry shows that





the financial situation of many shipping companies requires them to focus on mandatory investments due to regulatory changes in areas of ballast water treatment and emissions, rather than investing in smart technology development.

As such, subsidies should still be considered as catalysts for driving innovation with the strong objective of improving personnel safety. Subsidised projects will enable experimental testing, proof of concept and industrialisation on a larger scale to result in the required system cost reductions.

So what does RIMS have to offer to the market:

- Large experience and understanding of the challenges the end users are facing, especially in the maritime industry;
- Extensive national and international networks within the maritime industry, consisting of end users, original equipment manufacturers, etc. to support the establishment of consortia;
- Proven track record in strong project management, including the use of the innovation method Business Innovation By Design;
- Established contacts with technology centres such as technical universities in Delft, Twente, Eindhoven, Zurich, Lausanne and Lugano;
- An increasing network within the robotic industry (Robo Valley);
- We organise inspiration sessions, feasibility studies and innovation workshops;
- Facilitate project management for specific product development;
- Support the establishment of consortia and join them to promote the exchange of cross domain knowledge; and



- Support ways of introducing the products to the market through facilitating maintenance and lease solutions.

So what is RIMS looking for:

- Getting in touch with the right level of decision makers in areas such as regulatory, producers and end users who share the vision that innovation is the only way towards safer and sustainable maintenance; and
- Access to financing for activities such as:
 - Workshops to promote the technology;
 - Presentations to industry and regulators to support innovation;
 - Feasibility studies into new concepts; and
 - Participation in consortia which have a strong overlap with the maritime industry to bring benefits to both domains.

For RIMS the question is not so much 'if' but rather 'when' drones and robotics will bring their benefits to a safer and less resource intensive maintenance environment. It will be an interesting and rewarding journey for all parties involved. RIMS helps all parties involved to explore new sustainable maintenance strategies and translate them into new developments.

Pictures courtesy of Professor Anna Valente, Head of Industrial Robotic Systems for Advanced Manufacturing Technologies Group at University of Applied Sciences and Arts of Italian Switzerland Institute of Systems and Technologies for Sustainable Production.



David Knukkel
RIMS BV

+31 6 290 22 439

dknukkel@rims-bv.com

<http://www.rims-bv.com/>



Marine Maintenance World Expo 2016

Clever Marine Services Ltd recounts its success at the Marine Maintenance World Expo 2016 trade show

AS we have over the last two years, Clever Marine Services Limited (CMS Ltd) exhibited at the Marine Maintenance World Expo in Amsterdam from 21-23 June 2016. This year, the trade show was combined with the Electric Hybrid Exhibition and therefore attracted over 140 exhibitors and a vast amount of visitors from the marine and offshore profession.

Clever Marine Services was present with a 20-square-metre stand which we shared with our co-exhibitors from HASYTEC, Germany, who are worldwide marine distributors of HARSONIC ultrasonic antifouling (UTAF) solutions. CMS Ltd is acting as sales representative for the UK, the Americas and Africa for HASYTEC alongside their other representatives which are worldwide.

Clever Marine Services is an ISO 9001 certified marine and offshore service provider which carries out overhaul, repair and installation of any make and model of diesel engine and provides class approved ultrasonic thickness (UT) measurement up to corrosion management and the three basic NDT technologies, liquid particle inspections, magnetic particle inspection, and ultrasonic flaw detection, also including rope access personnel. CMS Ltd combines navigational, engineering, drawing and UT/NDT skills to perform consultancies or surveys for its clients. We represent IBS Scherer parts cleaning devices and solvents in the UK as well as HASYTEC, as mentioned above.

HASYTEC and CMS Ltd used the stage provided by the Marine Maintenance World Expo to showcase the innovative and efficient UTAF technology which holds the capacity to make costly docking for hull cleaning or sea chest and cooling system maintenance, as well as the antifouling paints, a thing of the past. UTAF transducers which protect cooling systems, hull plating, heat exchangers or whatever fluid carrying surface from biofouling can easily be installed in water and do not require docking.

The Marine Maintenance World Expo was a success for CMS Ltd as well as HASYTEC because we had a high level of interest in the UTAF transducers, in the services we offer and in the parts cleaning equipment from IBS Scherer. The expo was a good opportunity to network with existing clients which we had not seen for a while, but mainly the great amount of new interest for our services and products was encouraging for us. The discussions and talks with existing and potential clients during the three-day



expo resulted in new opportunities for us, for UTAF applications, and for engine overhaul and reconditioning for new clients.

One of the most interesting opportunities for UTAF application was the question raised by a visitor: can you protect fish farm netting from fouling and marine growth? Now that we have started to look into the possibility we can say that there are in general two ways to tackle this problem: either by attaching UTAF transducers directly to the netting or by floating the transducers so they protect the whole volume of water in the farming basin. The other potential application is in steam turbine condensers and fouling protections of cooling water piping, and outlets of industrial factories such as casting plants, bakeries and other factories that use a lot of cooling or treatment water.

The Marine Maintenance World Expo was a great exhibition for Clever Marine Services, but now we are looking forward to the SMM in Hamburg from 6-9 September this year. We hope to catch up with you there, but if not please do not hesitate to contact us with any query you may have.



Captain Sven Fromm
Managing Director
Clever Marine Services Ltd

+44 (0)1624 835123

svenf@clevermarine.com

<http://www.clevermarine.com/>



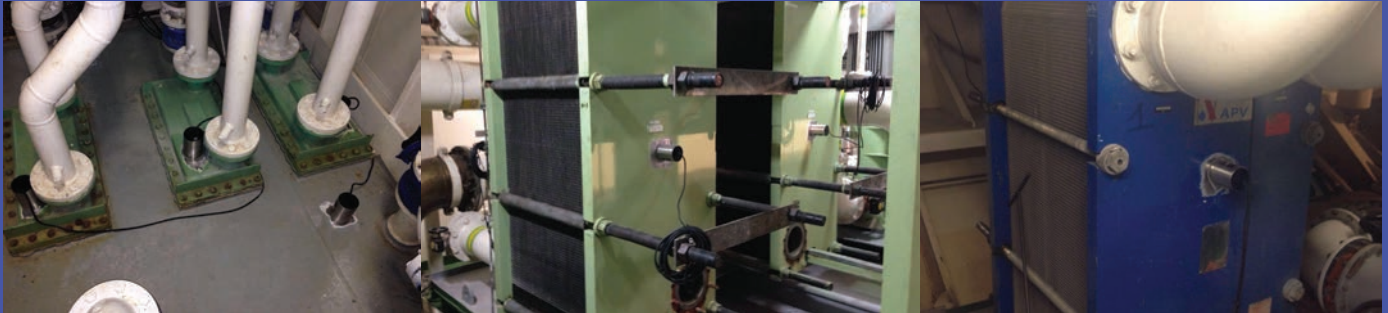
Bay House
 Bay View Road
 Port St. Mary IM9 5AQ
 Isle of Man
 UK

CONTACT

Cpt. Sven Fromm
 Managing Director
 mob: +49 (0)1522 4444479
 email: clevermarine@clevermarine.com

Lena Ruoff
 Sales / Office Administrator
 mob: +49 (0)1725 492064
 www.clevermarine.com

**NOW ALSO OFFERING THE FULL PRODUCT RANGE OF:
 HASYTEC Ultrasonic Antifouling (UTAF) Solutions**



CMS Ltd offers HASYTEC UTAF solutions which can be used for the protection of box and plate coolers, storage tanks for water, biofuels and others as well as the protection of the complete submerged structure of the vessel.

No docking and no maintenance required. Please call and make an appointment and we will be glad to present the equipment to you.

CMS LTD – FULL SCOPE OF SERVICES OFFERED:

- Overhaul and maintenance of all makes and models of diesel engines;
- Ultrasonic thickness measurement (UTM) and non-destructive testing (NDT) class approved;
- Superintendence and project management including drawing and solution services;
- ISM, ISPS and MLC consultancy and survey (pre-purchase, insurance, quality and quantity and others);
- Headhunting of marine and offshore experts; and
- Full technical management of any dry cargo, project cargo and bulk carrier vessels.



IBS Scherer GmbH has 40 years of experience in producing cleaning agents as well as parts-cleaning devices and machines. All products, whether cleaners, washing machines or devices, are 100% made in Germany and are designed and produced in an innovative, eco-friendly process.

The cleaning agents are produced using recycled cleaning agents, and the cleaning agent pumps of the parts-cleaning devices are fitted with a magnetic coupling which makes them virtually unbreakable.

Please see our website below for the full IBS Scherer GmbH product catalogue

www.clevermarine.com

Sondre Jacobsen, CEO of InnSep, highlights the persistent challenge of realising a clean shipping exhaust system and the potential for solutions

Simple, yet difficult

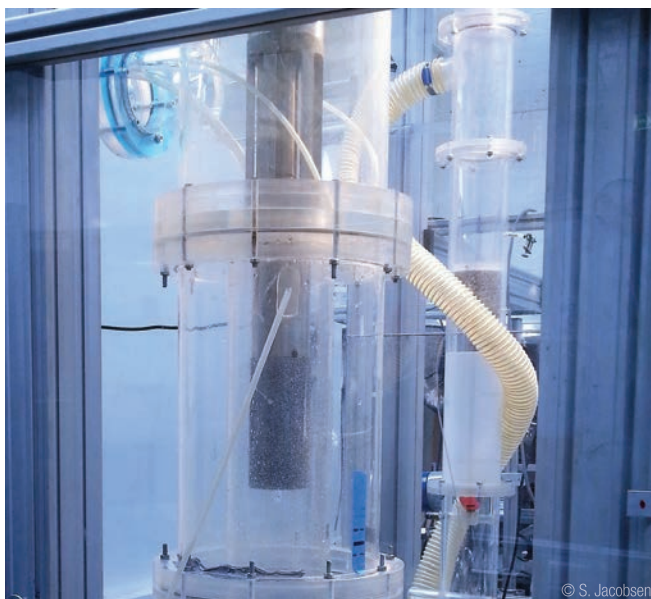
In this day and age, legislation has a focus on sustainability and cleaner air. This is the main driver behind the recently adopted directives that limit the amount of particles and fumes that ship engines can release close to shore and in ports. Currently, 60% of the global ports are covered by these regulations, with 100% of the global ports to be covered in the near future. This puts pressure on the 70,000 ships that are using heavy fuel oil with up to 3% SO_x content.

The technology to clean ship exhausts exists in many forms. The most radical alternative for clean or zero emissions is found in Norway, where a fully electric car ferry is in successful operation. It is a costly affair since it requires new technology for fast charging of huge battery banks and access to a power infrastructure able to handle peak consumption.

Another and more conventional approach is liquid natural gas (LNG). While different technologies can be used to comply with air emission limits, LNG technology is an option that can meet existing and upcoming requirements for the main types of emissions such as SO_x, NO_x, particulate matter and CO₂. In many cases, use of LNG does not require the installation of additional process technology.

Constant challenge

However, it is still clear that conventional, cheap, oil-based fuels with up to 3% sulphur content will remain the main fuel option for most vessels in the near future. This requires cleaning of the exhaust by spraying it with brine (salt water) so that the liquid droplets catch all the harmful particles. These droplets must be separated from the exhaust before it can be vented into the atmosphere.



Sondre K Jacobsen

This separation process is familiar. The separation of liquids from gases is one of the most common and fundamental industrial processes in the world. The technology foundation is well set to develop good solutions for the 70,000 ships running on heavy oil.

Yet there is a significant challenge. Current separation technology requires large volumes and has a considerable weight, which is generally not a challenge on land. For ships, that is a problem; with their exhaust funnels measuring up to seven metres in diameter, conventional technology would take up half the ship. Consequently, you either need to scale-up existing compact separation technology or compact existing huge separation types.

This is the realm where dreaded scaling factors occur, where practice decides to leave theory, and this is being discovered by the companies installing such systems today. Malfunctioning designs use extra energy to compensate, generating even more emissions.

The key of co-operation

There are good initiatives set forth in the collaboration between private companies and universities, such as the Norwegian University of Science and Technology in Trondheim. Yet the research and development and pilot testing require such a large scale that the current funding opportunities are not sufficient.

The combined risks and costs of conquering the factors of such scale are too high for any single actor to handle alone. To take the next step, legislation and funding must be scaled-up in proportion to the degree of challenges, risks and costs that such testing entails.

Sondre K Jacobsen
InnSep AS

www.innsep.com



DANISH MARITIME FAIR

COPENHAGEN, OCTOBER 25TH – 27TH

LARGEST MARITIME EVENT IN DENMARK!

Now already more than 60% fully booked, Danish Maritime Fair presents an 84m² large Shipowners' Lounge in co-operation with the Danish Shipowners' Association and a number of Danish shipowners, two large regional pavilions, five national pavilions as well as five conferences and many more events.

Join us!

Contact the organisers office via email: booking@danishmaritimefair.dk or by phoning +45 7020 4155



A. Henriksen Shipping
 ABB AS, Marine Service
 AHOY Rotterdam
 Alfa Laval Nordic
 ATPI
 Blue Ocean Solutions Finland
 Bridge Oil
 BS Specialslinger AS
 Bureau Veritas, Danmark
 Callenberg Technology Group AS
 CBS
 CODAN FORSIKRING, Marine
 Copenhagen School of Marine Engineering
 and Technology Management
 CRR Denmark
 CT Live Ltd.
 Dampa AS
 Danish Maritime Authority

Danish Shipowners' Association
 DanPilot
 Dansk Sorendningsselskab
 DESMI Danmark AS
 Emri AS
 Falck Safety Service AS
 Fayard AS
 Faaborg Jern
 G O Trading
 Gerhard D. WEMPE KG
 Division Chronometerwerke
 Granly Diesel AS
 Green Jakobsen
 Green Oil
 Hempel AS
 Iver C. Weilbach og Co AS
 Johnson Controls Denmark ApS.
 Keel

Lindlø UddannelsesCenter
 Lukoil Marine Lubricants Germany GmbH
 MAN Diesel og Turbo - KBH, København
 Marcod
 Maritime Development Center of Europe
 Media Group Maritime Denmark
 MS Engineering AS
 Navteam AS
 MS Maritime Museum of Denmark
 NSSL Global GmbH
 OSM
 PJ Diesel Engineering AS
 PP.Teknik
 ProMare ApS
 Rajant Corporation
 RINA Denmark ApS
 Rivertrace Engineering
 Scanjet Marine Ab

Serman og Tipsmark
 SH Group as
 Shippgaz Training AB
 Shipping.dk
 Siemens AS
 Simac
 SKF Danmark AS
 Skuld, Assuranceforeningen
 SpecTec ApS
 Svenskt Marintekniskt Forum
 Syddansk Universitet
 The Nautical Institute
 Thomas Miller Pogl
 Tuco Marine ApS
 Udvikling Fyn, Maritime Cluster Funen
 Uni-Tankers AS
 WeCare4u Danmark AS
 Wärtsilä Danmark AS

Main Partners



Gold sponsor



Silver sponsor



Bronze sponsor



Partners



EXHIBITION · CONFERENCES · EVENTS

WWW.DANISHMARITIMEFAIR.DK

With the nursing profession becoming more innovative, public health stands to gain immensely. Paul De Raeve and Dorota Kilanska explain

Nursing and public health

The European Federation of Nurses Associations (EFN) is the authoritative political voice of the nursing profession in the European Union, representing three million nurses in the European institutions. We advocate the advancement of nursing to the betterment of the health and social care ecosystem – both in terms of recognition of qualifications (Directive 2013/55/EU) and scope of practice. These are sustained priorities, embodied in the development of the EFN workforce matrix, EFN competency framework underpinning article 31 of directive 55 and the design, together with key alliances, of EU guidelines on advanced practice, prevention and e-prescribing. These innovations are part of the European Commission growth strategy. For example, the outcomes delivered in Poland since its EU accession (2004) shows the progress nurses have made for society.

Advanced practice is a new way of delivering cost-effective care, which also increases patient access to experienced healthcare practitioners. For the EFN, an advanced nurse practitioner is authorised for practice at an advanced level of nursing and healthcare delivery, including public health and prevention. Across the developed world, the EFN has observed rapid development in the advanced roles that nurses fulfill in response to the population's increasing and changing healthcare needs; yet these need addressing within restricted budgets (DiCenso *et al.*, 2010).

Advanced roles are a way to improve access to care, contain provider-related costs and improve nurse recruitment and retention rates through enhanced career prospects (Buchan *et al.*, 2013). There are also



Paul De Raeve



Dorota Kilanska

clear patient benefits, since high-quality health and social care relies on a highly educated, dedicated and skilled workforce. Specifically, the promotion of advanced roles for nurses can boost quality, safety and cost-effectiveness of the healthcare delivered (Delamaire and Lafortune, 2010). These roles have made an enormous difference on the governance and management of the health and social care ecosystem, and have been shown to improve efficiency, enhance patient care and improve patient outcomes. This means they are ultimately contributing to the sustainability of that ecosystem. For example, nurse prescribing is an evolving area of advanced professional development which is intended to enhance professional capacity and the development of new skills that lead to services that are more patient-focused and deliver better outcomes.

Competencies driving development

It is in this context that the directive, article 31, on nurse competencies in particular, is key to an organised and collective strengthening of the nursing workforce, which has been shown to improve outcomes (Aiken *et al.*, 2014). With a view to ensuring clear and consistent developments in this area, the EFN members led the development of the EFN matrix which sets the scene for conversations on the three categories of nursing care, clarifying definitions, competencies and qualifications between the: general care nurse; specialist nurse; and the advanced practice nurse. Knowledge of public health is one of the transversal skills that all nurses are expected to have, next to the importance of e-skills.

Consistent translation of the directive's educational requirements is crucial in levelling out variances in quality and safety of healthcare in the EU. To this effect the EFN competency framework was developed in collaboration with





leading experts in education. It analyses the key nursing competencies expected of an EU nurse and translates them in a user-friendly guide complete with descriptions of what is to be achieved, the necessary education to be covered in the curricula, and a list of potential learning outcomes that would prove the acquisition of such competences.

A parallel initiative involved the development of guidelines for advance practice roles, fully appreciating that changes in education must be accompanied by changes in practice, organisation and policy. This guideline offers an evidence-based pathway to the deployment of e-health services for the introduction and development of advanced roles. It identifies the key steps to be taken and main issues to be considered. Importantly, it highlights the main context and process factors that are likely to act as barriers and facilitators to the process. The Guideline on Nurse Prescribing is as such a good example of an advanced practice, especially when it comes to combatting antimicrobial resistance (AMR). The innovation needs to respond to the societal challenges it is confronted with.

Nurses play a key role in the school setting

Public health advances

It is within this context that the guideline on prevention plays a crucial role in public health. Public health nurses are key within the modernisation of the European health and social ecosystems in which community care will get preferential treatment. According to the World Health Organization, public health “Refers to all organised measures (whether public or private) to prevent disease, promote health, and prolong life among the population as a whole. Its activities aim to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases. Thus, public health is concerned with the total system and not only the eradication of a particular disease.”

It is important to highlight the general character of public health of which a close inter professional co-operation and collaboration is needed. For the promotion of public health the entirety of the health and social care workforce needs to work together, and be able to understand the strengths and limits of each separate profession that is active in the ecosystem. Nurses, physicians, pharmacists, physiotherapists and social workers all contribute in their own different way, and with their own different expertise, to educating and coaching the public towards a healthier life and wellbeing. However, somebody needs to lead, to manage, to make sure continuity of care is at the centre of integrated care, 24 hours, seven days a week, 365 days a year.

Poland's experience

The Polish case illustrates how nurses with appropriate qualifications are needed for the design of an integrated health and social care ecosystem,

in which better promotion of public health is a key milestone. Between 2005 and 2015, over 40,000 nurses in Poland progressed their level of education, using European funds (about PLN 170m (~€38m)), to develop advanced skills to provide care in collaboration with other healthcare professionals such as physicians, and independently as nursing professionals. In the area of public health, nurses work independently in many places, and as such comply with article 31 of European directive 55. Each family nurse delivered services to 2,750 clients in different settings, whereas school nurses visited 880 pupils for public health at schools in the country.

During the last 15 years the budget of the Polish Ministry of Health saw PLN 80m spent on developing nurses' skills using continuing professional development. In Poland there are nurses with high qualifications but without competencies to work with or in the 'health team' as an autonomous partner. Since 1999 Poland has been experiencing continuous changes in healthcare, and today it is time to use nurses' competencies to develop public health policy. Advancing the role of nurses in Poland is therefore key to developing cost-effective and high quality services in the entire health and social ecosystem, including the size and quality of the public health sector. Advanced nurse practitioners in primary care settings provide care equivalent to that provided by physicians in these settings, which positively influenced patient satisfaction and empowerment.

Another example are school nurses, who promote actions in favour of health protection and promotion, while serving as spokespersons for health issues faced by pupils; especially those who are ill and disabled. The school nurse is a co-ordinator of actions undertaken in favour of pupils' health. The nurse, in the fulfilment of tasks, co-operates with members of the interdisciplinary team. These nurses' independent interventions have taken place for about 18 years now (this refers to the period of individual contracts with the National Health Fund) and the evidence provided has proven it works well. A school nurse works autonomously, makes all the decisions independently without any support from physicians, takes full responsibility for nursing care plans, and maintains the health of young people and sometimes fulfils the role of a mother in a new environment.

Over the years we have observed an increase in the number of school children with health problems. The number of injuries has increased significantly, as has the number of posture defects, sight defects, bronchial asthma sufferers, children with cerebral palsy, diabetes, epilepsy, behaviour disorders, ADHD, and pupils who overdose on painkillers and have contact with drugs. This is why the continuous updating of a nurse's knowledge and the upgrading of professional qualifications is so important (Zajac 2016).

Contributing positively

To conclude, the nursing profession can and will contribute to the EU growth agenda; embracing innovation as the solution for the societal challenges we are all confronted with. Governments and policy makers need to embrace these innovations to build resilient ecosystems for the health and social care sector. Nurses' autonomy, as set out in directive

55, is the cornerstone for moving towards resilient systems, empowering women to lead change. The EFN sees these developments as a pressing matter given the increasing and changing health and social needs of EU citizens that demand better ways of organising and delivering both types of care. Within a context of tighter health and social budgets and rising demands for high quality and safe care, advanced roles for nurses are the key to making the best use of resources and improving outcomes.

References

- 1 Aiken, Sloane, Bruyneel, *et al* (2014) Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet*. May 24;383(9931):1824-30. doi: 10.1016/S0140-6736(13)62631-8. Epub 2014 Feb 26.
- 2 Delamatre M and Lafortune G (2010) Nurses in Advanced Roles: A Description and Evaluation of Experiences in 12 Developed Countries. *OECD Health Working Paper* No. 54. Available from: <http://www.oecd.org/els/health-systems/health-working-papers.htm>
- 3 DiCenso A, Bryant-Lukosius D, Bourgeault I, *et al.* (2010) *Clinical Nurse Specialists and Nurse Practitioners in Canada: A Decision Support Synthesis*. Available from: http://www.chsrf.ca/migrated/pdf/10-CHSRF-0362_Dicenso_EN_Final.pdf
- 4 Buchan J, Temido M, Fronteira I, Lapao L, Dussault G (2013) Nurses in advanced roles: a review of acceptability in Portugal. *Rev. Latino-Am. Enfermagem* 21(Spec): 38-46
- 5 Directive 2013/55/EU of the European Parliament and of the Council. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013L0055&from=EN>
- 6 ENS4Care (2015). *Evidence Based Guidelines for Nursing and Social Care on eHealth Services*. Guideline on Advance Practice Roles. <http://www.ens4care.eu/wp-content/uploads/2015/12/Final-ENS4Care-Guideline-3-Advanced-Roles-pv.pdf>
- 7 Zajac J (2016) Current situation of school medicine in Poland and suggested future changes to prevent and solve the present problems. District Chamber of Nurses and Midwives in Gdańsk, Report unpublished

Paul De Raeve
Secretary General
European Federation of Nurses
Associations (EFN)

Dorota Kilanska
Director
European Nursing Research
Foundation (ENRF)

www.efnweb.eu



Professors Marcin Skrzypski and Jacek Jassem, of the Medical University of Gdańsk, discuss how far microRNAs can be considered a new tool in cancer diagnostics

MicroRNAs – huge potential

MicroRNAs (miRNAs) are short, non-coding RNAs that play key physiological roles due to their regulatory role over gene expression. These molecules have attracted great attention as potential diagnostic tools in many diseases, including cancer. Importantly, miRNAs are analytically stable and can be derived from formalin-fixed paraffin-embedded (FFPE) samples, which are easily available in a clinical setting.

Background

Early cancers can be completely cured with excision or radiotherapy. However, a proportion of patients with apparently early disease at diagnosis have already developed occult metastatic lesions. Some of them can be cured by virtue of post-operative systemic therapies. However, currently available methods do not allow for the detection of patients harbouring micrometastases. Hence, to increase the overall chance of cure, many micrometastasis-free patients will receive excessive and toxic therapy. On the other hand, some patients carrying (on average) a low risk of relapse will fail because they do not receive potentially curative adjuvant treatment. This empirical approach based on the average risk in particular populations results in the overtreatment of patients who were administered unnecessary therapy and the under-treatment of those wrongly assigned to low risk groups.

Molecular prognostic markers are expected to better estimate prognosis in individual patients, thus allowing for personalised treatment approaches. Hereby, treatment should become more effective and less costly, whereas many patients may be spared the unnecessary toxicity and labour of pointless treatment.

Developing prognostic biomarkers

The development of prognostic biomarkers relies on two critical factors: assembly of tumour samples from patients and translational laboratory excellence. Amassing samples from defined patient cohorts requires expertise in clinical follow-up interpretation, which far exceeds standard clinical endpoints, such as overall or progression-free survival. A single large academic centre is usually capable of providing a patient group for marker generation (discovery series), whereas independent validation requires multicentre co-operation. This step should optimally be performed in a blind manner, with the involvement of a third party ('honesty broker') that supervises and objectifies the results. The choice of translational approaches depends on the study phase. In the case of miRNAs, next generation sequencing using frozen material is considered the best means in a wide search for potentially useful miRNAs, whereas RT-PCR or *in situ* hybridisation techniques using FFPE samples are useful for the optimisation and validation of previously selected and potentially useful miRNAs.

Medical University of Gdańsk

The Medical University of Gdańsk has focused on prognostic miRNAs in lung and colon cancers. Within the past ten years our biobank has amassed



Marcin Skrzypski



Jacek Jassem

around 2,000 fresh-frozen and matched FFPE lung cancer samples. Another series of samples was acquired from co-operating institutions. Colon cancer translational studies were initiated later but already include a few hundred stage-selected cases. For both malignancies we developed highly prognostic RT-PCR-based miRNA expression signatures that were positively validated *in silico* and are currently being validated in independent clinical series. We also search for miRNA signatures predictive for specific metastatic sites in the hope of paving the way to new preventive and therapeutic strategies.

Apart from their prognostic role, miRNAs have potential in predicting sensitivity to particular anti-cancer therapies. Our preliminary *in vitro* studies suggest that expression of certain miRNAs, in particular cancer cell lines, may be associated with their resistance to cytotoxics used in lung cancer. Finally, by comparing miRNA expression in tumour samples and corresponding normal tissues, we identified miRNAs that are highly specific to either lung or colon cancer. Detection of these miRNAs in blood may become the basis for non-invasive cancer detection. This idea has been pursued in the context of a large CT-based lung cancer screening project performed at our centre, and is currently a matter of confirmatory translational study accompanying another screening project.

In summary, the Medical University of Gdańsk has formulated several miRNA expression-based tests that may improve lung and colon cancer management. However, these assays still warrant validation in independent patient series. The next stage, final assays lockdown, is expected to be accomplished in co-operation with industry partners.

Marcin Skrzypski, MD, PhD
Jacek Jassem, MD, PhD
 Department of Oncology
 and Radiotherapy
 Medical University of Gdańsk

<http://scienceandresearch.mug.edu.pl/>

Treatment advances and new centres of excellence offer a lifeline to patients with inoperable neuroendocrine cancers, as Professor Dermot O’Toole tells PEN

New hope

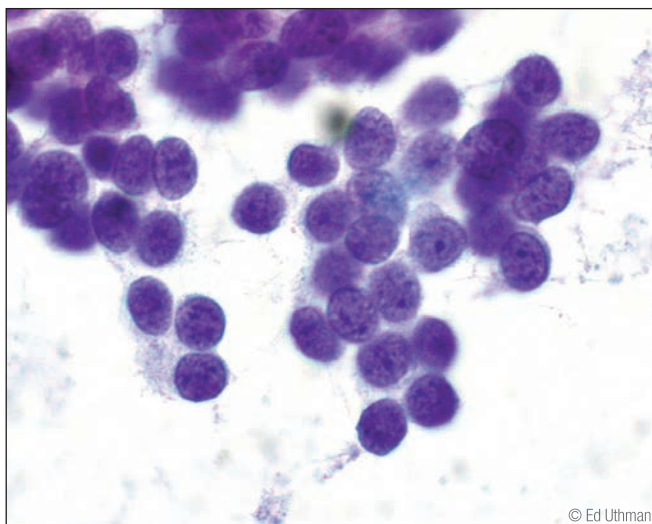
A novel drug proven to reduce the risk of disease progression by 79%, as well as three new European centres of excellence (CoE), could now offer new hope to patients with inoperable metastatic advanced midgut neuroendocrine tumours (NET). The novel drug, Lutetium-DOTATATE (Lutathera), has been found to have significantly lowered the risk for disease progression or death among patients with previously treated, advanced midgut neuroendocrine cancer, according to the phase III results of the NETTER-1 trial. Compared with patients treated with octreotide LAR 60mg, treatment with ¹⁷⁷Lutetium-DOTATATE resulted in about an 80% decreased risk for progression or death.

This phase III trial tested ¹⁷⁷Lutetium-DOTATATE, a peptide receptor radionuclide therapy (PRRT) that combines hormone therapy and radiotherapy. The study included 230 patients with inoperable, progressive disease and randomly assigned them to four administrations of ¹⁷⁷Lutetium-DOTATATE 7.4GBq every eight weeks or octreotide LAR 60mg every four weeks.

At data analysis, 23 patients in the ¹⁷⁷Lutetium-DOTATATE group had confirmed disease progression or death compared with 67 patients in the octreotide group.

Validated therapeutic option

Pan European Networks asked Dermot O’Toole, a consultant physician and associate professor at Trinity College Dublin, and a doctor at St James’s Hospital and the National NET Centre in St Vincent’s University Hospital, Dublin, Ireland, who was involved in the research, about the most significant findings with regard to the use of ¹⁷⁷Lutetium-DOTATATE and how this compares to the treatment of neuroendocrine tumours with other drugs.



A novel drug, Lutetium-DOTATATE (Lutathera), has been found to have significantly lowered the risk for disease progression or death among patients with previously treated, advanced midgut neuroendocrine cancer

He said: “¹⁷⁷Lutetium offers an important validated therapeutic option in patients with NET from the digestive tract in two circumstances. Firstly, when patients have progressed on somatostatin analogue therapy (easy to tolerate monthly injections), a treatment reserved for patients with fairly low grade tumours (Ki-67, <10%); or for patients with rapidly progressive disease or those with higher grade tumours.”

Centres of Excellence

In addition to the work surrounding ¹⁷⁷Lutetium, the European Neuroendocrine Tumor Society (ENETS) has established a rigorous quality procedure for the accreditation of centres of excellence in the treatment of neuroendocrine tumours. This programme has been extremely successful, with 34 centres now accredited and a further three (two in the UK and the first of its kind in Poland) receiving accreditation at the 13th Annual Conference of the European Neuroendocrine Tumor Society, earlier this year. ENETS has also presented the auditing process to the European Parliament in Brussels and it may yet serve as a paradigm for the planned European reference networks.

Recently, Professor Martyn Caplin, an internationally renowned gastrointestinal and pancreatic cancer specialist and chairman of ENETS, said: “Exciting new data with pharma sponsored trials such as Lutetium-DOTATATE, as well as other recent clinical trials such as RADIANT 4 with everolimus and TELESTAR with telotristat etiprate, together with ENETS’s work leading the way in developing accredited new centres of excellence, offers real hope for many patients with advanced endocrine cancer, whose second-line therapeutic options have been so limited.”

It is something that O’Toole expanded upon: “The central role of CoEs is to provide an accredited point of care for patients with NET so that their needs from a diagnostic and therapy/management viewpoint are



orchestrated by a group of experts according to the best international benchmarks.

“The main challenge involved here is the provision of all necessary components with regard to the centre’s structure, such as providing the necessary main and secondary partners capable of streamlined communication and interdisciplinary co-operation. The CoE also needs to have adequate supportive care and also provide quality-related documentation in measuring outcome. In addition, centres are required to expand and develop positively over time and ensure a high scientific outcome.”

Accessibility

Alongside these positive developments, there is a sense that more could perhaps be done at both the EU and member state levels to make treatments such as 177Lutetium more accessible to patients. Discussing this area, O’Toole said: “EU backing of an ENETS Centres of Excellence programme would be exceptionally positive for patients as more centres will thereafter strive for an EU-approved certification process. Official approval with an EU benchmark will also ensure that best standards of practice are officially recognised and should also obviate the need for separate national approval with the possibility even of cross-border initiatives.

“As in other rare cancers, EU backing will also enhance opportunities to support the development of vital clinical trials and answer a number of pertinent questions outside of

At data analysis, 23 patients in the 177Lutetium-DOTATATE group had confirmed disease progression or death compared with 67 patients in the octreotide group

industry-supported development. The EU can also help target development of CoE structures in southern and eastern Europe which currently do not have the resources.”

Paradigm

O’Toole also explained the steps which now need to be taken in order for the ENETS auditing process to serve as a paradigm for the planned European reference networks. He told PEN: “As the ENETS CoE certification programme has been independently accredited with constant readjustments in accordance with ENETS guidelines, frameworks and standards of care initiatives, adopting similar mechanistic programmes for other rare disorders is certainly achievable.”

Given the success of 177Lutetium-DOTATATE and the centres of excellence thus far, O’Toole referred to the CoE programme as a “vital cog in unifying patient care in a heretofore difficult to manage group of patients, due to the variety and complexity of these NET tumours.

“As ENETS has focused on excellence in NET patient care as a priority,” he concluded, “developing excellence structures within EU member states has raised the bar on all levels of patient care and this will translate not only into better and more streamlined care but, as has been shown in the past, the CoE model of care will lead to improvements in overall survival.”

Access to Lutetium is an example of a vital recent addition to an ever increasing therapeutic option that is now available to the enlarging community of NET carers.

Dermot O’Toole
Consultant Physician & Associate Professor
Trinity College Dublin

<http://people.tcd.ie/Profile?Username=otooled1>

Dr Tariq Sadiq from St George's, University of London discusses a new test for the rapid detection and subsequent treatment of four of the most common sexually transmitted infections

Put to the test

Innovate UK recently awarded a grant to a consortium of UK universities who hope to develop a new test that could detect four of the most common sexually transmitted infections in 30 minutes and allow them to be rapidly treated. The diagnosis and treatment of sexually transmitted diseases has become very challenging for doctors and this new test will allow for patients to have their precise infection identified to enable treatment with the correct antibiotics, immediately after they see a doctor.

Dr Tariq Sadiq, chief investigator at St George's, University of London, spoke to Pan European Networks about the challenges posed by STIs both in Europe and further afield, including antimicrobial resistance (AMR), and how the new test will help to address some of these issues.

What do you feel are the biggest challenges currently involved in detecting/treating STIs, and what major benefits will the new test bring to this?

The major issues with regard to curable STIs relate, at the global scale, to reproductive health in women and maternal-child health, particularly related to chlamydia, syphilis and a relatively newly identified STI called *Mycoplasma genitalium*. Confounding that is the issue of antibiotic resistance, which is having a significant impact on some of these infections, particularly gonorrhoea and *M. genitalium*.

To take syphilis as an example: if a pregnant woman has been recently infected, this is a major risk in terms of congenital disease, and also for preterm and still births, and testing for syphilis using portable and rapid diagnostics can play a major role, particularly in those resource-poor settings where routine laboratory testing of pregnant women isn't really in place.

STIs remain a major problem, and one of the ways in which we can have an impact on them is to understand how we can test for them effectively, as well as how we can come to follow a more personalised approach, because antibiotic resistance is a significant issue. Indeed, the WHO has determined that gonorrhoea, a very important STI globally, is one of the pathogens that is seen as being on the front line of the AMR crisis. Gonorrhoea in many ways epitomises the global challenge with regard to resistance to antibiotics, because it rapidly changes its resistance profile in response to the way in which antibiotics have been used over the last 50-60 years to treat it. This is in marked contrast to many other pathogens where resistance develops and spreads slowly. With gonorrhoea, we change our treatment guidelines every few years and they are always in danger of being out of date immediately.



There is a huge burden of morbidity and mortality attributable to syphilis and testing plays a major role here, particularly in those resource-poor settings where the mechanisms of screening women aren't really in place at the moment

Some may argue that gonorrhoea is not going to kill people and should therefore not be seen as a priority, but this fails to take into account the fact that it can cause serious reproductive harm such as infertility, preterm birth, ectopic pregnancy and miscarriage.

Treatment options are beginning to run out, and it is not always possible to wait to provide the right treatment to a very mobile and sexually active population. Treatment for gonorrhoea is often based on what we think is likely to be the right treatment, purely because we don't have time to wait for the results of tests because patients will not always return for them. That is why the tests that we are now developing are so important, as we are looking to diagnose



patients with gonorrhoea or other infections as well as their antibiotic resistance profile immediately so that we can ensure that they are given the correct treatment.

Our tests will offer the choice to recycle old drugs for some patients. Many of these drugs are no longer being used due to the high levels of resistance. Our new test should enable us to find which of those drugs still has potential, which may take some of the pressure off new antibiotics and, perhaps, have an impact on the emergence and spread of resistance.

How pronounced are the differences between the developed and developing world with regards to the type of diseases and the scale of transmission?

The differences are significant. The WHO has documented some 357 million curable STIs a year worldwide, and that just relates to well-known infections such as chlamydia, gonorrhoea, trichomoniasis and syphilis. The highest rates are in resource-poor settings, particularly south and southeast Asia and sub-Saharan Africa. The developed world

The highest rates are in resource-poor settings, particularly south and southeast Asia and sub-Saharan Africa

certainly sees these infections also, but at nowhere near the burden experienced in other parts of the world.

High income countries have, to a varying degree, reasonably successful systems in place to prevent the serious consequences of many STIs. For example, the impact of chlamydia infection and to an increasing degree *M. genitalium* infection is often carried without symptoms amongst women who are sexually active, and these asymptomatic infections can also cause reproductive problems in women such as pelvic infections, inflammatory disease and infertility.

Opportunistic testing or screening programmes for chlamydia are already in place in many European countries. Studies have demonstrated that the introduction of screening can have a positive impact on complications that can damage fertility, and the results of these studies were used to justify the introduction of the National Chlamydia Screening Programme (NCSP) in the UK. This encourages young people to go to their GPs or sexual health clinics for chlamydia testing, with the specific aim of impacting on the reproductive health consequences of this STI. The NCSP has certainly resulted in many more people being tested and treated for chlamydia, and its impact on reproductive health in the UK is being measured.

When testing patient samples for STIs in a laboratory, it usually takes a few days to turn around a result to the clinic, but now there are tests emerging that can do things much more quickly – so-called ‘point-of-care’ or ‘rapid’ tests. These enable test results to be available either in a couple of hours or, more recently, in half an hour. These technologies mean that people can



potentially be treated while waiting in the clinic. This potentially reduces the duration that any individual is infectious, which may impact on the spread of the infection in the population.

How does your work with the new smartphone app tie into the evolution of these testing methods? Can you tell me more about the eSexual Health Clinic?

The mobile phone work which we have set up has been developed in a close collaboration between St George's, University College London, Public Health England, Queen Mary University of London, Brunel and Warwick universities.

The app or eSexual Health Clinic enables patients to use their smartphone to receive their results and then to be immediately linked to an online care pathway for the management of chlamydia infection. This care includes an online consultation assessing whether it is safe to get patients to access their treatment outside of a clinic setting, say, for example, in a pharmacy. There are safeguards built in – such as the ability to ring a health expert or to opt to go down a traditional doctor-led consultation. The preliminary data suggests that the online care pathway is highly acceptable and quite safe in ensuring proper care.

Have you seen any hesitancy towards that with regard to data protection issues and security?

That was one of the major areas that we focused on during development. The group conducted a significant amount of qualitative research to better explore the stakeholder and patient concerns and regulatory hurdles. We found that patients are generally very confident

The developed world has, to a varying degree, reasonably successful systems in place to prevent the serious consequences of many STIs in terms of maternal health

if things are done under the banner of the NHS; there is a sense that, despite the misgivings about data protection that have been covered in the media in recent years, people are still confident in the British National Health Service. Interestingly, we also found that many people would be more concerned about privacy, in that if they receive their test results on a mobile device then they would want to ensure that others are unable to see these results – this is particularly important with regard to young people. One way of solving this would be to encrypt the results to ensure that only patients would be able to see them.

Presumably, this stands to help reduce pressure on the NHS and GPs in particular?

Yes, this is one of its potential impacts – and there is currently a lot of discussion on how we can deploy new ways of internet-based care. However, these new systems of care need to be tested or at least monitored further before being fully implemented to see if they are fully effective and safe.



There are also further opportunities when considering the developing world, where internet-based care may have a much more profound impact as many people live far away from clinics, restricting their access to care. There are diagnostic tests being developed where the smartphone is part of the test, and this further increases the utility of allowing many more people to be tested, treated or monitored for infection, without them having to attend clinics.

Is the same stigmatisation of STIs present in the developing world as we perhaps find in the West?

Stigma is fairly universal but can vary depending on which country, culture or setting you are in, and also which STI you are talking about. For example, with regard to HIV infection, it is often assumed that stigma prevents people from coming forward to be tested. However, in South Africa and many countries, it is often the case that communities actually want to be tested for HIV and perhaps health professionals had underestimated this enthusiasm or presumed reluctance.

For patients who live 50-100 miles away from the clinic, the ability to use mobile phone technology in remote settings to test people, send results to clinics, get results back and give treatment would be invaluable

For example, looking back over the years we as doctors and carers may have been overly sensitive or over cautious about HIV testing for fear of stigmatisation, with testing not being encouraged as it could have been.

What do you feel has brought about that paradigm shift?

While my own experience of working in the developing world is limited, I suspect that there is a mixture of factors. Community activism is widely recognised as being highly important. Such activism has influenced communities and policy makers to support testing, create counter narratives around blame, shame and immorality, for example.

How important is it for industry to be involved?

We work very closely and responsibly with industry, and their involvement is incredibly important because we want to ensure as far as possible that, if new technologies are developed that have the potential to make an impact, they will not become shelved before they can be realised.

Dr Tariq Sadiq
Chief Investigator, eSTI2 Consortium
Director of the Applied Diagnostics Research and Evaluation Unit
St George's, University of London

<http://www.sgul.ac.uk/international-blog/multiple-stis-could-be-detected-with-researchers-developing-a-single-30-minute-test>

Moritz Tannast, MD, and colleagues at the Swiss universities of Zurich and Bern discuss how the ovine model can prove useful in treating femoroacetabular impingement

How sheep can help people

Femoroacetabular impingement (FAI) is a recently described pathomechanism of the human hip which has meanwhile been accepted as the main etiology of so-called 'primary' osteoarthritis.¹ FAI is defined by an early, painful pathological contact of subtle osseous prominences of the hip during motion, leading to pre-arthritis damage of the cartilage and the labrum.² Fig. 1 shows a normal human hip is able to rotate without pathological contact during a physiological range of motion (Fig. 1, left). Femoroacetabular impingement is defined as an early pathological contact of the femoral head-neck junction with the acetabulum creating focal damage at the rim (Fig. 1, circled area). The most frequently found pathomorphology is an aspherical femoral head (Fig. 1, grey area), which is squeezed into the hip socket called 'cam-effect', creating the typical joint damage (Fig. 2). If left untreated, the hip can further progress to end-stage osteoarthritis, eventually requiring total hip arthroplasty (Fig. 2). FAI is common – almost every fourth young Swiss man presents with an asphericity of the femoral head.³ FAI is relevant – since its introduction in 2003, the first original description of FAI has become the sixth most frequent publication in orthopaedic hip research.⁴ FAI can be successfully treated surgically through the early removal of these prominences, which can improve symptoms in up to 80% of patients after ten years (Fig. 3).⁵

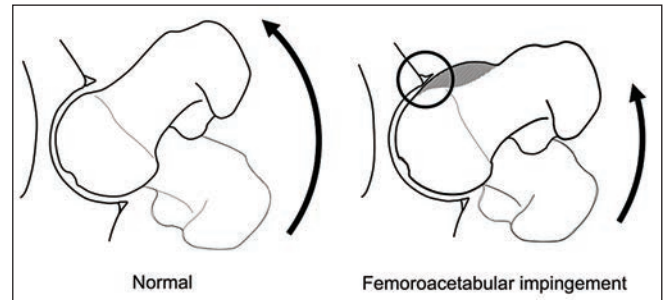


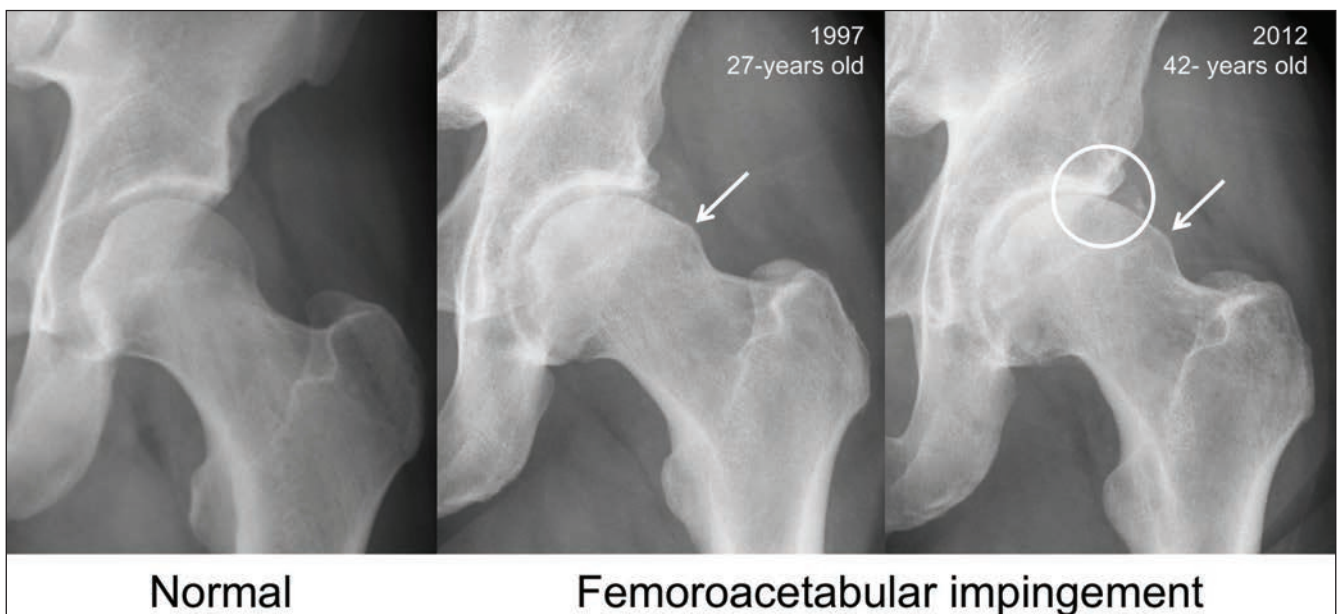
Fig. 1 A normal human hip (left) and a hip with femoroacetabular impingement (right)

Fig. 2 Left: normal human hip with round femoral head. Mid: hip with an aspherical femoral head-neck junction (arrows) leading to femoroacetabular impingement in a young patient. Right: if left untreated, the hip progresses to end-stage osteoarthritis (circle) after 15 years

Open questions in clinical practice

There are many questions open in the clinical treatment of FAI. Most of these relevant questions are very hard to address in human beings for various reasons. Burning questions in clinical practice are:

- Can we stop the degenerative process? This would take decades of observational time in human beings. In an appropriate animal model, this question could be answered within months;
- Is prophylactic surgery indicated? Most of the patients already present with significant cartilage damage at the time of first presentation, although the pathomorphology



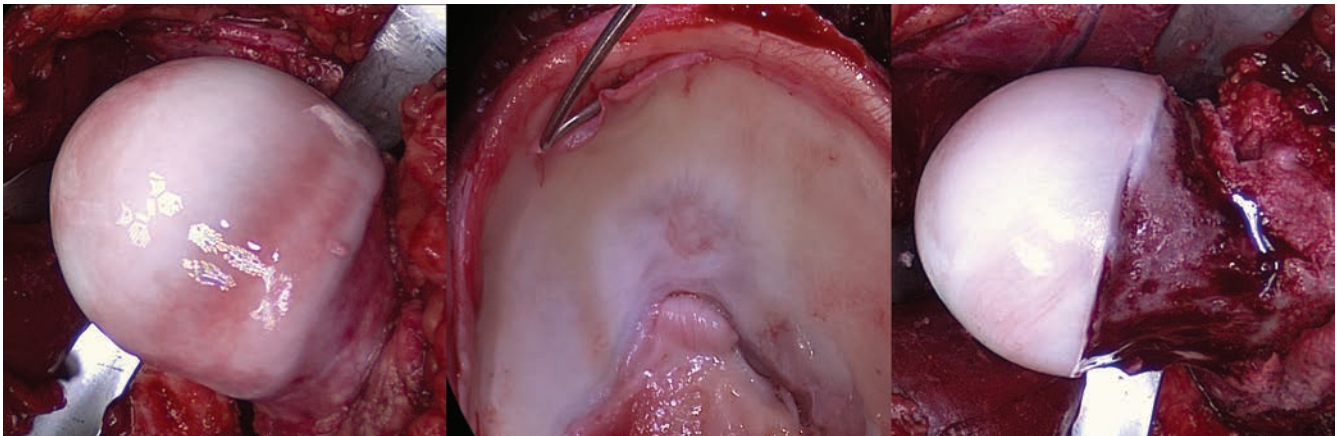


Fig. 3 An aspherical human femoral head (left) causing early cartilage degeneration due to femoroacetabular impingement (mid) and its surgical correction (right)

has existed for many years. With an appropriate animal model, a clear starting point of the disease could be induced and the effect of prophylactic surgical treatment simulated and evaluated;

- When is it too late for surgery? It is unknown at which time point the morphological correction of FAI is too late so that the joint degeneration would proceed even with correction of the underlying pathomorphology;
- Can we monitor the joint degeneration by modern biochemical MRI methods? In human beings, a direct correlation of the joint damage on modern MRI with histology is not possible in the postoperative course – in contrast to an appropriate animal model; and
- What happens with the cartilage when novel cartilage repair techniques are applied? In human beings, a histological analysis in the postoperative course is impossible. However, in an animal model both the histological evaluation and the comparison with contemporary MRI methods can be applied to novel cartilage repair techniques.

The sheep model

We introduce an experimental sheep model for evaluation of FAI. Sheep have been chosen as an animal model since they share a quite similar hip anatomy with human beings, including a horseshoe-shaped acetabulum and the presence of a labrum. In contrast to dogs, there is no known predisposition for primary osteoarthritis of the hip in sheep. Interestingly, sheep have comparable hip joint force

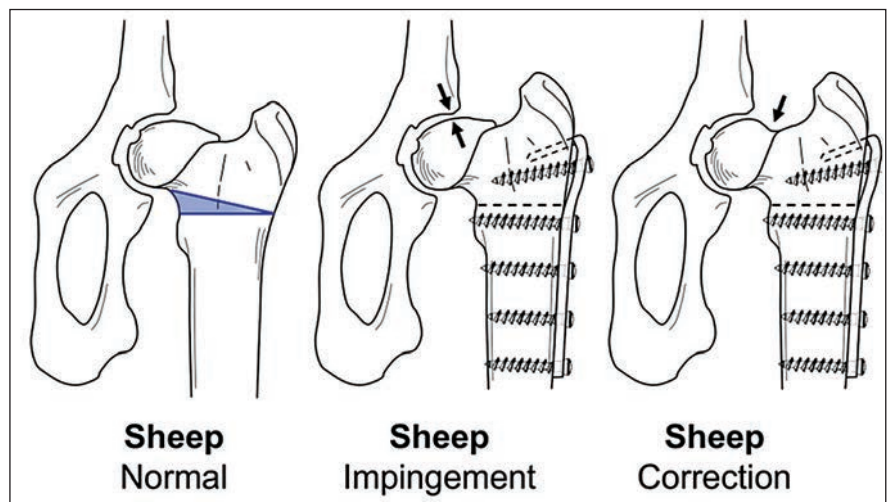
magnitudes and directions with human beings.⁶ A particular feature of the ovine hip is its natural femoral asphericity, which closely resembles the aspherical morphology seen in human FAI hips. By performing an intertrochanteric closed wedge varus osteotomy, the aspherical portion of the ovine hip can be rotated into the acetabulum, producing a similar cam-type FAI as seen in men (Fig. 4). Due to their quadrupedal gait, the location of the damage is located posteriorly (Fig. 5) – unlike human beings where it is located anteriorly.² The early, time-dependent osteoarthritic changes can be created within weeks and closely resemble the degenerative changes seen in young human hips with FAI (Fig. 6). The deformity can be corrected in a similar way in human beings through resection of the aspherical femoral head-neck junction.

Pilot experiments

Four pilot studies have been conducted: a simulation study to prove that the actual joint damage occurs at the site of femoroacetabular impingement, a biomechanical analysis of the stability of the corrected ovine hip, anatomical studies to describe the blood supply to the ovine femoral head, and a pilot study comparing the histological damage with biochemical MRI sequences:

- In a 3D computer simulation study using advanced imaging software, we were able to show that the actual joint damage occurs at the predicted site of impingement (Fig. 5).⁷ This proves that the joint

Fig. 4 Left: sheep have a natural asphericity of their femoral head-neck junction. By performing an intertrochanteric closed wedge osteotomy, a similar cam-type FAI conflict can be created, as seen in human beings (mid). Right: the asphericity can be corrected surgically



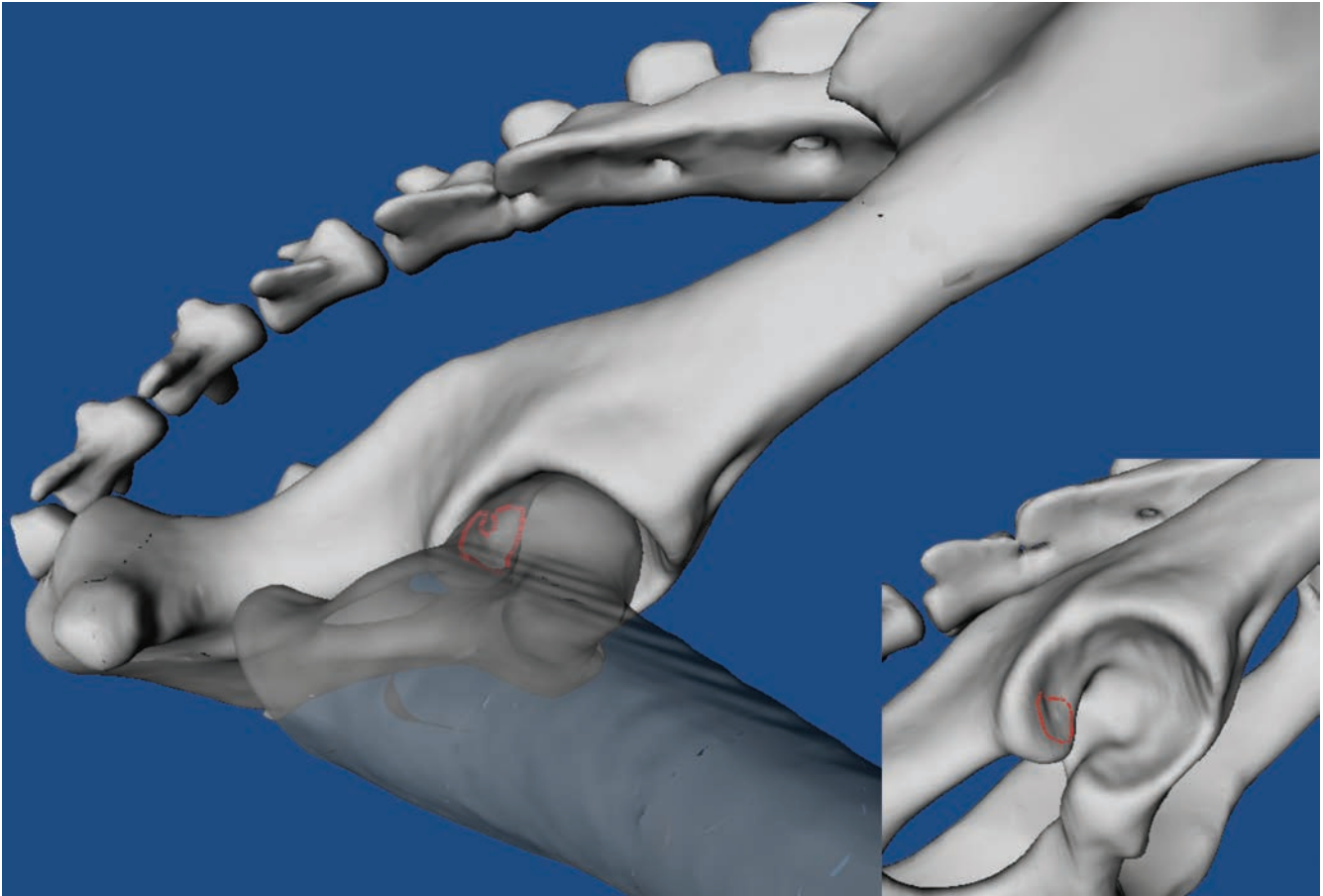


Fig. 5 (above left) The three-dimensional virtual simulation after surgical induction of FAI in the sheep hip shows the resulting impingement zones in the posterior aspect of the joint

damage is created by the motion-induced conflict and is not a result of an altered joint pressure distribution;

- The biomechanical analysis could show that a resection of the aspherical portion in the sheep hip does not decrease the stability of the proximal femur to a relevant degree;
- The anatomical studies were designed to describe the topographical course of the femoral blood supply to the ovine femoral head. Based on CT-angiography, vascular corrosion casting and vascular silicone injections, we were able to show that the femoral head is supplied by two retinacular arteries which are anterior and posterior to the femoral asphericity (Fig. 7).⁸ In a clinical trial, we did not observe any

avascular necrosis of the femoral head after correction of the deformity (Fig. 8); and

- The fourth pilot study on imaging could show that the early cartilage changes can be detected with biochemical MRI methods.⁹

Main study

A prospective, experimental, controlled main study is currently being performed at our institution which is designed to address the abovementioned questions using the methods evaluated in our pilot studies. In a total of 50 hips, an FAI will be induced surgically on one side with the contralateral side being used as the control.

Half of the hips will receive an additional cartilage therapy which will be evaluated in the postoperative course by repetitive MRIs and histological investigations, eventually.

Summary

The proposed ovine FAI model offers the platform to answer clinically relevant questions in the field of FAI and early osteoarthritis in a specific way. It is an excellent example of the

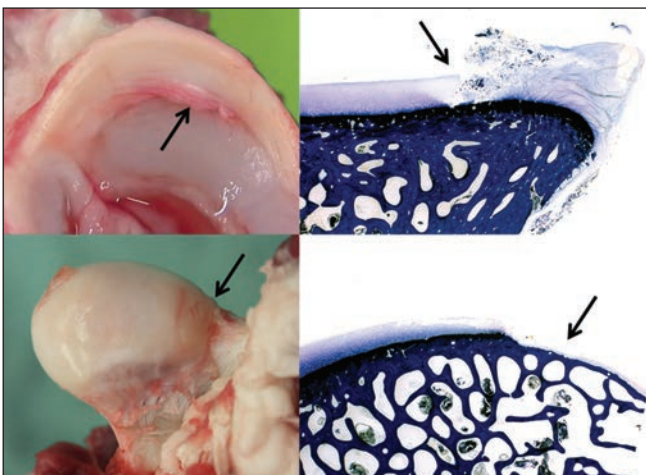


Fig. 6 The resulting macroscopic and histological chondrolabral damage of the sheep model is similar to the damage in human beings

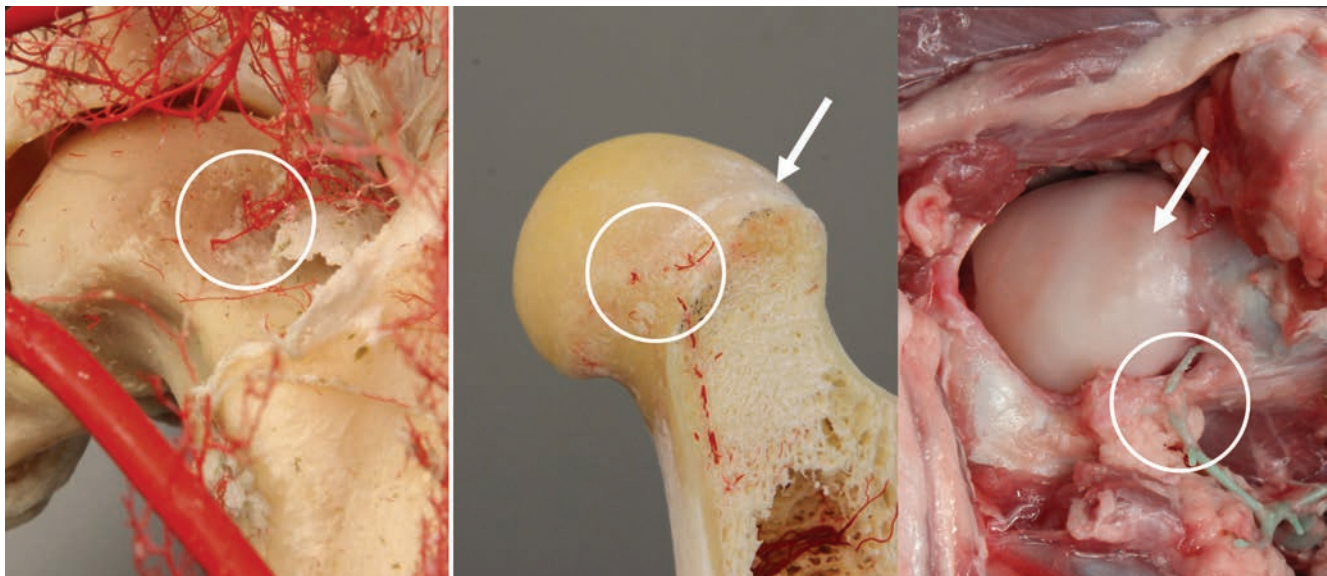


Fig. 7 The ovine femoral head receives its blood supply from retinacular vessels (arrows) that are not located at the naturally aspherical portion of the femoral head (arrow)

application of translational medicine. The model provides information about the value of potential prophylactic treatment, the histological effect of surgical correction on the cartilage, information about the value of biochemical MRIs for decision making, and the platform for evaluation of cartilage therapies in the future.

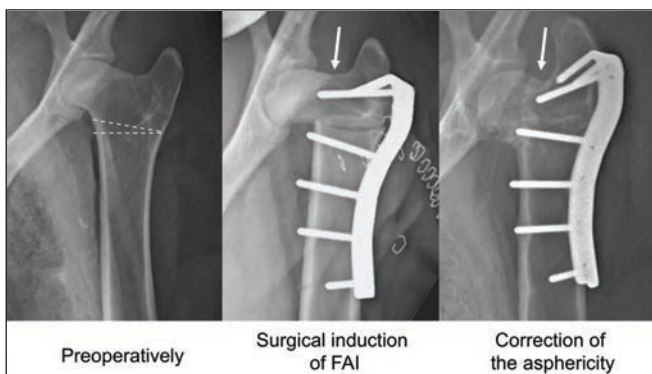
References

- 1 Ganz R, Parvizi J, Beck M, Leunig M, Nötzli H, Siebenrock K. Femoroacetabular impingement: a cause for osteoarthritis of the hip. *Clin Orthop Relat Res.* 2003;(Dec;417):112-120.
- 2 Tannast M, Goricki D, Beck M, Murphy S, Siebenrock K. Hip damage occurs at the zone of femoroacetabular impingement. *Clin Orthop Relat Res.* 2008;466(2):273-280.
- 3 Reichenbach S, Jüni P, Werlen S, et al. Prevalence of cam-type deformity on hip magnetic resonance imaging in young males: a cross-sectional study. *Arthritis Care Res Hoboken.* 2010;62(9):1319-1327.
- 4 Ahmad S, Albers C, Büchler L, et al. The hundred most cited publications in orthopaedic hip research - a bibliometric analysis. *Hip Int.* 2016;26(2):199-208.
- 5 Steppacher S, Anwander H, Zurmühle C, Tannast M, Siebenrock K. Eighty percent of patients with surgical

hip dislocation for femoroacetabular impingement have a good clinical result without osteoarthritis progression at 10 years. *Clin Orthop Relat Res.* 2015;473(4):1333-1341.

- 6 Bergmann G, Graichen F, Rohlmann A. Hip joint forces in sheep. *J Biomech.* 1999;32(8):769-777.
- 7 Zurmühle C, Wolfer N, von Rechenberg B, Nuss K, Siebenrock K, Tannast M. Hip Joint Damage Occurs at the Zone of Femoroacetabular Impingement (FAI) in an Experimental Ovine FAI Model. Presented at the Annual Meeting of the Orthopaedic Research Society, Orlando, Florida, March 2016.
- 8 Wolfer N, Steppacher S, Siebenrock K, et al. The blood supply of the femoral head in sheep – surgical implications for an established experimental ovine FAI model. *Swiss Med Wkly.* 2015;145:2-2.
- 9 Siebenrock K, Kienle K, Steppacher S, Tannast M, Mamisch T, von Rechenberg B. Biochemical MRI predicts hip osteoarthritis in an experimental ovine femoroacetabular impingement model. *Clin Orthop Relat Res.* 2015;473(4):1318-1324.

Fig. 8 Clinical example showing the sheep hip preoperatively (left), after surgical induction of FAI (mid) and after surgical correction of the asphericity (right, arrows). There is no radiographic evidence of avascular necrosis of the femoral head



Additional authors

K Nuss, DVM
Brigitte von Rechenberg, DVM
 Musculoskeletal Research Unit, Vetsuisse Faculty, University of Zurich, Switzerland

Klaus A Siebenrock, MD
 Department of Orthopaedic Surgery, Inselspital, University of Bern, Switzerland

Moritz Tannast, MD
 Musculoskeletal Research Unit
 Vetsuisse Faculty
 University of Zurich, Switzerland
 Department of Orthopaedic Surgery, Inselspital
 University of Bern, Switzerland

+41 31 632 2222
 moritz.tannast@insel.ch

Heinrich Daembkes and Laila Gide discuss the ARTEMIS Industry Association's Strategic Research Agenda 2016 and why digitisation must be addressed now

The time for talking is over

In a recent high-level conference on the digital transformation of European industry and enterprises, speed was underlined as an essential component in Europe's competitiveness and much needed economic growth and jobs. The message to Europe's policy makers and industry leaders was a clear call for immediate and bold action to accelerate the digital transformation and seize business opportunities, or risk getting left behind in the wash of the fourth industrial revolution.

On 13 April 2016, the ARTEMIS Industry Association presented its Strategic Research Agenda (SRA) 2016 in Vienna. The aim of this SRA is to create the pathway to digital transformation, enabling a more agile and shorter development cycle of embedded intelligent systems through the adoption of design-by-composition and correct-by-construction principles. It also aims to overcome fragmentation in the European supply base for design and engineering components and tools. By focusing on providing strong technological capability over the whole value chain, barriers can be removed between application contexts to yield multi-domain, reusable components ('building blocks') for embedded intelligent systems, extending the use of digital platforms to build the stronger ecosystems that are needed to accelerate innovation and create new business models.

Silent revolution

The digital evolution, or digitisation, is a silent revolution that is transforming our way of living and of doing business. Cyberphysical systems technology is nowadays widely recognised as a core enabling technology that lies at the heart of the development of many innovative products and services. The digital transformation provides a great opportunity to open new markets to every business in Europe and beyond.

We believe that technologies should not be considered in isolation and that by breaking down such 'artificial' barriers new innovative businesses will emerge. These will bring to market a new and wider variety of smarter products and services that will reshape the future and create new unprecedented opportunities. Empowered by digital investments, disruptive business models and improved production processes, European companies can generate international market opportunities with new products and services. From engineering and automotive to healthcare and pharmaceuticals, all industrial sectors are being impacted as value shifts rapidly along the value chain.

So Europe cannot linger in using this leadership in cyberphysical systems, these embedded intelligent ICT systems that make products smarter, more interconnected, interdependent, collaborative and autonomous. They provide computing and communication, monitoring and control of physical



Heinrich Daembkes



Laila Gide

components and processes in various applications. Harnessing these capabilities in time and across space creates applications with enormous and disruptive new functionalities with unprecedented societal impact and economic benefit for citizens and societies. In the future, cyberphysical systems will manage complex systems (e.g. smart grids, transport or water management systems) and will make everyday objects intelligent (e.g. homes, offices, cars, trains, cities and clothes), the latter being connected to the internet, leading to a network of physical objects – the internet of things (IoT).

Combining technologies

The major power of the fourth industrial revolution lies in combining digital technologies with other advanced and leading-edge technologies for maximum resource efficiency and EU competitiveness. Creating suitable architectures and services as well as corresponding innovation strategies and new business models is helping to modernise Europe's manufacturing capabilities; in the near future, traditional factories will increasingly be transformed into smart digital manufacturing environments.

Arrowhead

Such is the collaborative automation approach that has been embraced by the ARTEMIS Innovation Pilot Project known as Arrowhead. Driven by software (systems) and connected through the internet of things, collaborative automation, of course, knows no borders. The significant gains in productivity (higher efficiency, lower costs) of this approach have already been demonstrated, especially in production, smart buildings and infrastructures, electromobility, and the virtual market of energy. The Arrowhead community is growing in size and strength, demand is tangible, and the foundation has been laid for collaborative automation to have widespread, real business impact. By creating a wiki page, which contains links to architecture, code examples, working

code, and working systems, as well as documentation on how to use the Arrowhead framework and how to implement your own IoT automation services and systems, something of a meeting place has been established to share ideas and facilitate organic growth and change. This really is a case of a key digital transformation in action, one that is attracting interest not only in Europe but even as far afield as Japan.

This collaborative and cross-domain approach must be complemented by the development of common building blocks to make significant advances in design-by-composition. This will also accelerate the development cycle, maximise the re-use and the time to market, be more cost efficient in the adoption and deployment of technological solutions, master their growing complexity, ensure safety, security and privacy, allow flexibility, and facilitate interoperability between the various systems.

The emancipation of information

If we take a moment to pause and think about this whole evolutionary process from the mechanical to the digitised ecosystem, we could do worse than to consider photography as an illustration. The first products existed in a mechanical or analogue (physical) form. These were then transformed into a digital form in the evolution from integrated electronic components to embedded software. The next step was integration into the digital mobile phone, as photography and music converged into one device, the internet-connected smartphone, and, consequently, a system within a large system with cloud storage and computing, and satisfying a wide range of functional and non-functional properties.

There has been a shift from systems to system of systems where interoperability, particularly semantic interoperability, will be an essential ingredient in enabling users of physical artefacts and their embedded intelligence to use the different languages of different domains but nevertheless still 'understand' each other. The emancipation of embedded information with semantics creates possibilities for completely new types of application that have not been possible to date.

Unprecedented potential

Thus, as cyberphysical systems of systems emerge, characterised by a large number of



Spring Event 2016: From left to right: **Laila Gide** (vice-president, ARTEMIS-IA), **Ben Ruck** (head, Public Authorities Board, ECSEL), **Heinrich Daembkes** (president, ARTEMIS-IA), **Michael Wiesmüller** (PA Austria) and **Dr Max Lemke** (head of unit, CONNECT-A3, European Commission)

physical devices and computing elements that are interconnected in both physical and informational terms, the vastly increased amount of information and the new level of connectivity offer unprecedented potential for more efficient operation, higher flexibility and adaptability, improved levels of reliability, and better quality of products and services. Connectivity provided by the internet of things will become an enabling technology for cyberphysical systems of systems that close the loop from the sensor information to actions performed by physical systems in transportation, energy systems, production plants, logistics, smart buildings, etc.

In the aerospace domain, for instance, aircraft (manned and unmanned) in an all-connected environment will no longer be the sort of high-tech vehicles that are isolated from the rest of the world. Airborne crews – and also the automated systems – will require real-time connection to download the latest flight and service details, and passengers will demand an internet connection or want to be streamed from the moment they board, while onboard systems will need to communicate with the ground for mission or maintenance reasons. Everything that can be automated will be automated, will embed a higher level of intelligence and acquire greater cognitive capabilities.

Once again, echoing the call to Europe's policy makers and industry leaders, we must seize the tremendous opportunity we have to make the digital transformation happen. Greater pan-European collaboration will help overcome the barriers to digital growth, with joint cross-border programmes and investments able to give the digitisation of industry at local and regional level a real boost; and 'open innovation' can accelerate the process, bring new thinking into organisations, and ensure that the best ideas are implemented and successfully brought to market.

Heinrich Daembkes
Laila Gide
ARTEMIS Industry Association

<https://artemis-ia.eu/>

Professor David Ellis of the Institute of Management, Law and Information Science, Aberystwyth University, provides an insight on knowledge and information architecture

Knowledge and information architecture

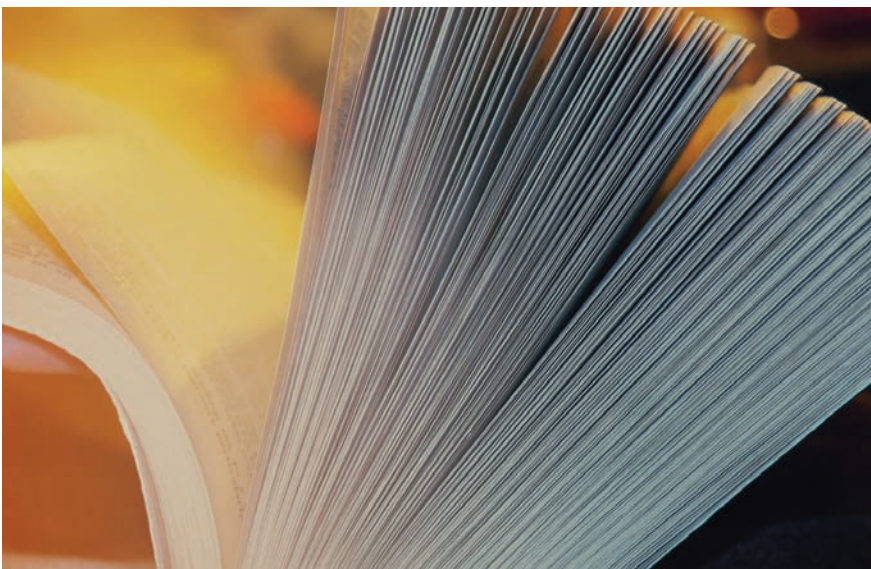
Knowledge and information architecture is a blend of ideas, approaches, tools and techniques derived from information management, knowledge management and information architecture. In this respect it draws on a vast literature from these various sub-disciplines – first from information management, then knowledge management and then from information architecture. This literature ranges from the 1980s and 1990s through to the present day with different subjects coming in and out of fashion, but all contributing to the contemporary perspective embodied in the knowledge and information architecture approach. This provides a robust underpinning for understanding technological developments in how we treat information in our society and how we engage tactically with information and knowledge in organisations. Knowledge management is concerned with making explicit the tacit or implicit knowledge of organisations (Dalkir, 2011), and its origins can be traced back to the end of the 1990s.

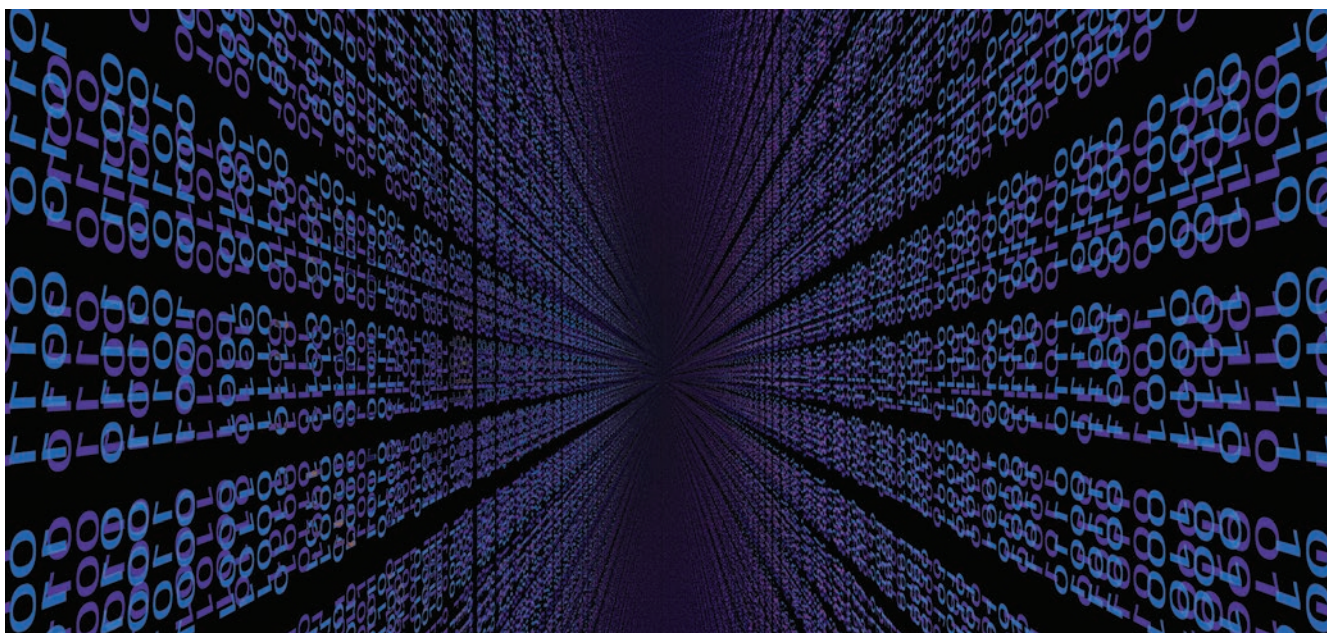
Information architecture has been defined as: an emerging discipline and community of practice focusing on bringing principles of design and architecture to the digital landscape (Morville P, Rosenfield L, 2006, p4) which emerged in the early years of the 2000s. Information and knowledge architecture combines the discipline of information architecture with the power of knowledge management to drive organisational change (Evernden E, 2003).

The link between knowledge management and information architecture is made particularly clear in a dissertation by Taljaard (Abstract, 2007): 'Knowledge management is defined in terms of the ability of organisations to manage knowledge as a strategic resource in order to

gain an advantage from it. In the knowledge management framework, knowledge is presented as a continuum consisting of tacit, implicit and explicit knowledge. Tacit and implicit knowledge is managed through the acknowledgement of the social nature of knowledge. One method to achieve this is communities of practice. On the other end of the spectrum explicit knowledge is very close in nature and character to information. Due to the expansion of available information resources the design and structure of information (explicit) knowledge for effective retrieval has become very important. Information architecture is a field that specialises in the design and structure of information for effective retrieval. Traditional information architecture tools such as metadata and subject classification address some of the issues but experience difficulties in heterogeneous environments such as the internet. The conclusion of this dissertation is the representation of a conceptual model [showing] the clear and direct link between knowledge management and information architecture.'

From this perspective it is possible to fully exploit the opportunities for handling knowledge and information as organisational and social assets. The starting point is usually to explore the relationship between data information and knowledge and, from this, the concept of information as a resource. Therefore, the techniques of information and communication audits essential for understanding the information use of the individual and the organisation can be deployed in the management of information as a resource. Concepts from knowledge management can be used to explore knowledge transformation, diffusion and absorption in organisations, as well as the role that 'communities of practice' play in organisational learning. Approaches to sorting and organising information can be





deployed in the development of networks and hierarchies, classifications and taxonomies, including folksonomies and the use of social media. Finally, knowledge and information architecture provides techniques for designing for change and evolution in approaches to open data, and sharing of information can be explored and evaluated – including the use of XML and RDF.

Two come together

Information and knowledge architecture, then, is a blended subject and, as with any blend, there is a mixture of balance and taste and differences of approach. However, the sources are clear: 1) information management; 2) knowledge management; and 3) information architecture. From the first comes the notion of information as a resource and approaches to valuing and managing information, including techniques such as information auditing, information mapping, and communication auditing. From the second, the distinction between tacit, implicit and explicit knowledge, and the role of communities of practice in knowledge transformation. From the third, approaches to organising explicit information through subject classification, taxonomies and ontologies are gained. The precise mix depends on the individual or on the individual needs of the organisation. The mixture of ideas, tools and techniques may be unique, but the sources are generic and well-documented.

Knowledge and information architecture can help in making sense of data

Challenging essence

Because the sources of knowledge and information architecture are different and diffuse, defining the essence of knowledge and information architecture as a subject is not really possible. The different sources share some common interests but are manifestly different in approach and emphasis. The focus differs according to the individual viewpoint. Perhaps this is to be expected in an information landscape that has been transformed and re-transformed over the years, making the contemporary information environment almost unrecognisable from what it was a few decades ago and, in many respects, only relatively recently. So knowledge and information architecture, as a subject or discipline, attempts to address contemporary issues against the background of established knowledge and practices and the consequent re-definition of the role of the information profession in the changing information environment. Its applications could include, although are not restricted to, information governance and handling knowledge and information as organisational and societal assets, through to the use of mobile apps, social media, open data, knowledge sharing, mashups, augmented reality and Big Data.

References

- Dalkir K (2011): *Knowledge Management in Theory and Practice*, 2nd Ed., London, MIT Press.
- Evernden R and Evernden E (2003): *Information First: Integrating Knowledge and Information Architecture for Business Advantage*, London, Routledge.
- Morville P and Rosenfeld L (2006): *Information Architecture for the World Wide Web*, 3rd Ed., Sebastopol, CA. O'Reilly Media Inc.
- Taljaard L (2007): *Mapping the relationship between knowledge management and information architecture*. MPhil Dissertation, University of Cape Town, South Africa.

David Ellis
Professor
Institute of Management, Law and Information Science
Aberystwyth University

<https://www.aber.ac.uk/en/dis/>

Participation 2.0

The U_CODE Project introduces a new tool for citizen communication and co-creation in urban design

In the future, professional designers will design cities in close co-operation with the citizenship. Beyond technocratic planning, the shaping of our urban realm will become a democratic process in which civic stakeholders participate as co-creators and co-designers. From the beginning of a project, citizen experts will contribute their experience, opinions and ideas, and keep an active voice throughout the design and development process. Positive public commitment, constructive discussion, and high identification with projects will emerge from this new form of co-creation.

Challenge: public participation in urban design projects

In today's democratic societies, the public has gained substantial influence on urban design projects – up to the level of fully inhibiting a project's progress. Cases of public disagreement in European countries have shown over the past years that pursuing a thorough planning process is not a guarantee of public acceptance of ambitious urban projects. Large-scale constructions can suffer heavy delay if the general public, as well as citizen experts, are not supportive, thus implying substantial risk for developers and investors. Established approaches of public involvement have proven insufficient in the light of contemporary means of communication and opinion making.

The measures in place for informing the public and for voicing potential public disagreement are based on conventional media. Ignorance of today's social media capabilities for information and exchange, however, may add to public feelings of being ignored in decisions relevant for daily life and the work environment. What is more, in the case of unexpected challenges throughout the project development, decision makers often employ inadequate communication strategies and fail to reconsider project goals on the basis of the new facts. Citizens and taxpayers who expect

municipal decisions to be part of a transparent democratic process feel increasingly disconnected and uninformed. In consequence, their trust in the capacity of public administration to manage large projects declines.

Negligence of public opinion and lack of communication may result in a vicious cycle of overreactions, as could be observed in the case of the Stuttgart 21 railway station project in Germany. Here, the public's feeling of not being adequately involved motivated protests that eventually escalated into massive project disruption. As became clear, social media has turned into a powerful mechanism for the co-ordination of protests and for the amplification of resistance and aversive propaganda.

Implications: risks and insecurity

The implications of inadequate project communication and involvement in large-scale public projects are severe. On the side of citizens, frustration will grow about disconnected politicians, despite them being elected representatives. Public distrust in political leadership can lead to dramatic turnover in political power, as was demonstrated in the German federal state of Baden-Württemberg. On the side of planners and developers, there is the threat of massive time and cost increases which cannot be covered or planned with risk budgeting (the Stuttgart 21 project saw a multibillion euro cost increase). For authorities, investors and developers, bad publicity and conflicts between the public and police will directly affect investment interest. Uncontrollable protests and delayed, or cancelled, projects decrease the attractiveness of a region, its real estate value and the overall trust in cities and regions. High risk and insecurity for development projects mean loss of time, investment and reputation, and may finally result in severe damage of a place's overall image and global awareness.



Demand: a tool for massive citizen collaboration

The public, as well as planning administrations, calls for a collaborative instrument that allows co-evolution of projects, idea sharing and mutual perception of all partners involved in the process. Whereas tools for e-participation have been developed already in order to involve citizens and stakeholder groups, there are no adequate digital instruments yet which enable creative participation on a massive scale. This is the very challenge for co-design environments today: they must enable communication and collaboration between large numbers of citizen and professional experts, and ensure a creative, focused and secure design process for projects of high public concern. Subsequently we need a methodology that can co-ordinate massive input from the 'crowd' into meaningful planning information, eventually leading to convincing project results.

Project: U_CODE Urban Collective Design Environment

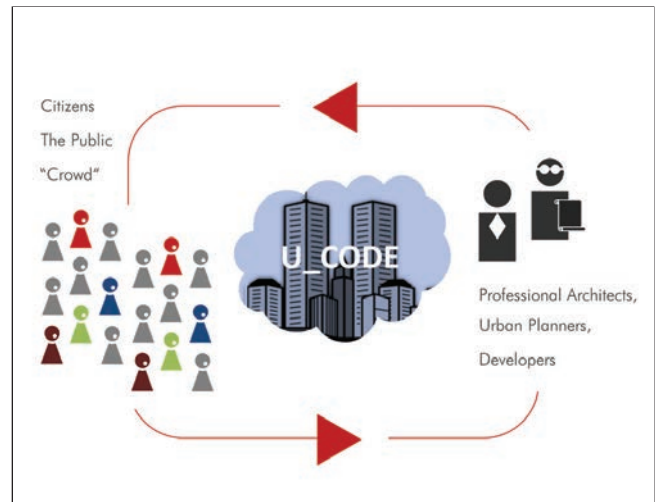
Started in February 2016, the Horizon 2020 project U_CODE: Urban Collective Design Environment endeavours to create a conceptual, organisational and technical platform providing a new quality of public involvement and participation. The project will create a mock-up tool and run pilot projects in different countries that will be carefully analysed and documented. Lead by Technische Universität Dresden, the international partnership includes academic partners from ISEN Toulon, a renowned IT engineering school in France, and TU Delft, a leading institution in the field of participatory design processes and user-driver innovation.

Industrial partners are Conject Ltd., an affiliate to Aconex Ltd., which provides the most widely used cloud-based, multi-company project collaboration solutions for construction and engineering worldwide, and French software company Optis Imagine, a specialist in high-quality visualisation. Our partner in design practice is gmp Gerkan, Marg & Partners, a leading German architecture and urban design office that looks back on hundreds of large-scale construction projects all over the world, including airports, railway stations and public centres. The scientific co-ordination is in the hands of the WISSENSARCHITEKTUR Laboratory of Knowledge Architecture, a multidisciplinary research unit of TU Dresden, supported by the Silicon Saxony Management GmbH for the exploitation and dissemination of project results.

Goals: new software platform, workflow and professional roles

Within three and a half years, our partnership will deliver software for the co-design platform and a new process for project planning and development, plus detailed procedures and rules for all acting parties. We will supply a concise, market-ready product description and a business model that outlines cost reductions and overall sociotechnological advantages. The key novelty of U_CODE is a public project space for non-professional civic users: a highly accessible, low-threshold interface to address an audience ranging from schoolchildren to elderly people. It will present information about projects in an understandable and transparent manner.

For citizens who want to engage actively in the design process by creating ideas and contributing comments, this 'project playground' will supply highly experiential design and



communication instruments. In effect, U_CODE will enable professional creatives to work with the public's creativity, to follow public opinions and sentiments, and to derive design intelligence from these sources. Thus, U_CODE will not only add a new dimension of knowledge on top of technical project data but also instigate an entirely new workflow that is going to transform the design and decision making processes by the impulses of citizen experts as a driving force.

Market: stakeholders and applications

U_CODE addresses municipal authorities that want to enhance project communication, public integration and political credibility. Public project developers, as well as public project owners, can facilitate with U_CODE an uninterrupted, secure and smooth project development. On the private side, developers and project owners will use U_CODE to secure private investments and to achieve a competitive advantage and unique selling point for their ventures. The main user of U_CODE, before all, is the citizenship itself, for which U_CODE presents an easy-to-use and entertaining tool for participation and involvement.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 688873.



TECHNISCHE
UNIVERSITÄT
DRESDEN



Dr Ing Jörg Rainer Noennig
Project Co-ordinator
WISSENSARCHITEKTUR
Laboratory of Knowledge Architecture
Technische Universität Dresden

+49 (351) 463 32210

joerg.noennig@tu-dresden.de
www.u-code.eu

The Global Partnership for Education pursues quality learning in the developing world, as PEN details here

Education and development

When it comes to education and international development, the Global Partnership for Education (GPE) is a key actor. As a multilateral organisation the primary mission of GPE is to ensure that all children in the poorest or least developed countries (LDCs) can access quality education. Bringing together 65 developing countries, with 20 donor governments, alongside civil society, private foundations, companies, teacher organisations and international organisations, the partnership pushes forward action on the global ambition to realise quality education for all. At the helm of GPE is former Australian prime minister Julia Gillard, who serves as board chair, and Alice Albright, who served in US President Barack Obama's administration from 2009 to 2013, serves as chief executive officer.

Goal four of the UN's Sustainable Development Goals (SDGs) is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. With clear targets on a variety of levels of education, gender disparities, teacher training, literacy and numeracy, educational scholarships and more, goal four lays out a framework for global success.

Strategic ambitions

For GPE, the SDGs are a turning point, and the organisation has launched a new strategic plan from 2016 to 2020 that pursues the goals. At the core of the plan is an embracing of a change from access to education and a shift towards delivery of quality and equity in education. The plan hopes to see the strengthening of GPE systems internally and in the delivery of programmes. Further, acknowledging the transformative potential of data, the strategy stresses the use of data and a results-driven approach in pursuing work.

On 9 June, Gillard and Albright released a blog post reflecting on the organisation's strategic plan. Placing clear attention on how well the fourth SDG goal was embraced, and underlining the continuing focus on delivering quality education in the world's poorest countries, the two leaders emphasised their commitment to inclusive partnerships in working to achieve the GPE vision.

They brought their post to a close by saying: 'We are on the right track. But there is so much more to do, which is why our board of directors, following a year of intensive discussion and consultations with all of our constituencies, has embraced this strategic plan to guide us for the next five years. GPE 2020 is our path forward to ensuring that every child can fulfil their right to a quality education. In the spirit of the UN's Global Goals, GPE 2020 is our commitment to ourselves, our partners and the world community. We invite you to join us in the cause of ensuring quality education for all.'

Gillard outlined the importance of the plan further in a piece opening the GPE strategic plan: 'In 2015, with the full support of the United Nations, the world renewed its commitment to fighting poverty and inequality. All of us promised to create an era of sustainable development by achieving 17 Global Goals by 2030. Goal four commits us to ensuring equitable,

quality education for all. In addition to this specific and ambitious goal, the world recognised education as a key enabler of prosperity, peace and the broader vision of sustainable development. Yet more than 120 million children of primary and lower secondary school age are out of school today, many living in areas blighted by violent conflict. Millions more receive schooling of such poor quality that they fail to learn.'

Gillard continued by saying that the level of resources made available for school and early childhood education, in particular the poorest and most marginalised, is 'woefully inadequate'.

'The Global Partnership for Education is determined to overcome these challenges. GPE is the only global development organisation solely focused on education. We are dedicated to strengthening national education systems in order to dramatically increase the number of children who are in school and learning. Achieving such a transformation requires local and global resources and the skills and commitment of many, working together toward a shared mission and holding each other to account.'

She went on: 'GPE 2020, our five-year strategic plan, details that shared mission and the steps it will take to get it done. It captures our vision, our practical approach and our dedication to partnership. I commend GPE 2020 to you. It reflects the unified aspiration and commitment of our unique partnership: more than 60 developing country governments and more than 20 donor nations, plus international organisations, civil society, philanthropy, teachers and the private sector.'

'Hundreds of millions of children around the world today are counting on us. With your support, their dreams for a good quality education and a brighter future will come true.'

During a meeting of the GPE board of directors on 14 and 15 June this year, the board endorsed a raft of measures to pursue progress on operational and technical preparations needed to push forward GPE 2020 ambitions.



© Godot13

It appears that the organisation remains committed to advancing work in this direction.

Conflicting interests

Amidst the disruption of conflict and crisis, educational support to children becomes at risk. While education receives less than 2% of humanitarian aid, one-quarter of the world's school-aged children and youths live in countries affected by conflict, and it is estimated that in 35 crisis-affected countries, 75 million school-aged children and youths are presently not in school. The educational prospects of girls are disproportionately affected by crises, with girls being 2.5 times more likely to be out of school than boys. Consequently, with the low levels of funding and breakdown of educational systems in such situations, there is concern that entire generations of children and youths are being denied the right to an education.

Launched during the World Humanitarian Summit on 23 and 24 May, the Education Cannot Wait initiative is designed to combine efforts to deliver education in emergencies. Bringing together actors working across education and development matters, GPE is a key partner.

Speaking on 20 May Gillard said: "The new fund will help to make the crucial link between humanitarian aid and long-term development, ensuring that children's education is not forgotten. GPE strongly supports Education

Cannot Wait and is committed to make it a success so children can continue going to school during times of conflict, emergencies and protracted crises."

As wars, natural disasters and emergencies continue to increase across the world, becoming ever more frequent and complex, attention is falling on the educational needs of children living in crisis. Seemingly aware of the challenge, and the important contribution that education and development can make, the GPE has been building support in the area and already provides 50% of funds to countries affected by conflict and instability. Prior to backing Education Cannot Wait, earlier this year GPE signed an agreement with the United Nations High Commissioner for Refugees (UNHCR) on collaboration to support education for refugee children and youth.

Signing the agreement on 15 April, Albright said: "When emergencies and crises occur, education is often disrupted for extended periods of time. But even in the most challenging contexts, it is critical to engage in efforts to strengthen education systems and improve co-ordination to ensure that children can continue to go to school and fulfil their right to an education. Education provides normalcy during chaos and is a foundation upon which everything else can be built."

Time to act

Taking a comprehensive approach in bringing together the multiple tools available to those active in education in the world's poorest countries, GPE evidently continues to champion quality, equitable education for all, as well as working to improve girls' education and delivering education in emergencies.

With work advancing under a new international development agenda, it remains to be seen how well the world will do in achieving the fourth Sustainable Development Goal.



The World Humanitarian Summit on 23 and 24 May in Istanbul considered the future of the humanitarian aid system. Here, CIVICUS secretary general Dr Dhananjayan Sriskandarajah reflects on the outcome

Humanitarian future

The first World Humanitarian Summit has come and gone. Apparently, more than 1,500 commitments emerged from the two-day meeting which saw some 8,000 people, from 173 countries, discuss the future of the global humanitarian system at over 200 separate events. It was an intense two days; here is an attempt to synthesise my thoughts on the summit's outcomes and what it might all mean for the work of the humanitarian community in the coming years.

Let's begin with the good bits. We saw unprecedented high-level political recognition of the scale and complexity of the challenges currently facing the humanitarian system, and from this flowed several important commitments to improving the *status quo*.

Perhaps the most concrete outcome of the summit was The Grand Bargain. Trailed in our pre-summit report, 'Too Important to Fail', this landmark agreement, reached by 30 of the world's largest donor governments and major aid organisations, should see more than USD 1bn (~€898m) redirected to frontline humanitarian aid services over the next five years thanks to improved efficiency and accountability measures. The bargain includes 51 specific commitments across ten key areas, focusing on simplifying and harmonising bureaucracy and using national and local channels to get more aid to where it's most needed faster.

But, for me, the most exciting aspects of the agreement are those that signal a move towards putting local people at the heart of the system – commitments such as the increased use of cash transfers as opposed to the provision of vouchers or food to communities affected by crises.



Dr Dhananjayan Sriskandarajah

We know cash transfers are more efficient – they cut out chains of 'fundermediaries' and their associated reporting requirements – but they are also more empowering, acting as a useful stimulant to the local economy.

In a similar vein, I was party to exciting discussions about the possibilities of greater use of technologies such as 3D printing. Instead of relief supplies being flown in from far-away places, innovations such as this would enable tents, medical supplies and much more to be manufactured quickly within, or close by, the communities that need them most.

Local action

The Grand Bargain also committed its signatories to a target of 25% of funding going directly to local NGOs by 2020. The current total stands at around 0.2%. This re-balancing of aid provision will give us a far greater chance of building long-term capacity close to the ground. The localisation agenda was further supported by the launch of NEAR, a network aimed at reshaping the current top-down system to one that is locally driven and built around equitable, dignified and accountable partnerships.

World leaders and heads of state on the first day of the World Humanitarian Summit in Istanbul, Turkey, on Monday 23 May 2016



27 international NGOs signed up to the new Charter4Change, committing to passing 20% of their funding to national NGOs by 2018, as well as addressing the negative impact of recruiting staff from local organisations, thereby draining their capacity.

In order to support these positive moves towards a more multifaceted, owned humanitarian system, CIVICUS has committed to working with the Dutch minister for trade and development, MasterCard and the Hilton Foundation to establish an expert working group that, over the next 12 months, will design and pilot a new humanitarian financing tracker. The tracker will move us beyond a narrow vision of official aid flows from a few developed countries to the rest of the world and beyond crude divisions between developed and developing countries, state and non-state actors, and humanitarian and development expenditure. By enabling us to track the totality of humanitarian support, including increasingly important flows from middle income countries, domestic spending by countries all over the world, and private contributions from philanthropists and individuals, the new measure will help us to build a more complete picture of our collective response to emergencies.

For me, these were the green shoots that signal the beginning of the end of the development industrial complex. The end of an era in which a few rich countries provided aid through a few big players. I do believe that we have begun to incubate the humanitarian system of the 21st Century. Those were the positives.

Not just positives

But some of the fears ahead of the summit – that there wouldn't be sufficient action on breaches of international humanitarian law or on dealing with current refugee crises – proved to be justified. The summit was weak on both counts. So too were fears that states wouldn't be obliged to commit to anything new, standing as the summit did outside of other long-term integrated intergovernmental processes. Indeed the heads of state from the G7, Angela Merkel excepting, were a no-show, inciting the opprobrium of Ban Ki-moon.



Hosted in Istanbul, the summit saw the humanitarian community consider the future of the international humanitarian system

In the end, I don't believe historians will look back on this summit as a watershed moment for the humanitarian system. For the most part, what we agreed to was to tinker with what we've already got. We agreed to improve aspects of the current system, and some of them radically so. But we stopped short of acknowledging that what we actually need is a new system, or perhaps something more like an ecosystem.

We need to redefine what we mean by humanitarian. We need to move away from the top-down, command and control, cross-border, big player-led, aid-based system we constructed in the 20th Century. We need something much more multifaceted, something that puts local actors and affected people at the heart of humanitarian efforts, something that doesn't just respond by flying relief in from far-flung places when unforeseen disaster strikes, but which works to reduce humanitarian need by tackling its root causes, and building the long-term resilience of local communities.

We didn't get there in Istanbul, but it was an important leg of the journey. Our challenge now is to take up the commitments made, ensuring that they are translated into a roadmap for what must come next and against which we can hold all parties to account. Above all, we must ensure that the commitments are translated into real, disruptive, profound change over the coming years. This change will be the first step towards constructing the new global humanitarian model the world so urgently needs.

Dr Dhananjayan Sriskandarajah
Secretary General, CIVICUS
Member of the High-Level Panel on Humanitarian Financing

www.civicus.org



Viktoriya Krakovna, co-founder of the Future of Life Institute, spoke to PEN about AI X-Risk and how the research community is working to ensure that future intelligent technologies remain beneficial to humanity

Future intelligence

The Brain Bar Budapest events model themselves as ‘Europe’s festival on the future, where we debate the issues that will define our future in the long run - unhindered by conventions and unapologetic about breaking taboos.’ Brain Bar Budapest exists to question the *status quo* and foster debate on tomorrow, focusing on how new developments could transform citizens’ lives and the future of society in Europe and beyond.

The 2016 instalment of the event, which took place on 2-4 June, included philosophers, disrupters, technologists and ethicists, amongst whom Viktoriya Krakovna, co-founder of the Future of Life Institute (FLI), which is funded by Elon Musk and advised by Professor Stephen Hawking, delivered a presentation on Artificial Intelligence Existential Risk (AI X-Risk) – artificial super-intelligence dispensing with its creators.

Speaking with PEN after the event, the artificial intelligence (AI) researcher discussed some of the ethical issues and potential threats posed by AI, and how the research community is working to ensure that future intelligent technologies are beneficial to humanity.

Currently, it is perhaps fair to say that AI is not that ‘intelligent’. Where do you feel that research needs to look to advance this (models of the human brain etc.) and are these areas currently taking into account the ethics of doing so?

Some of the remaining milestones on the way to advanced AI include things like better unsupervised learning and one shot learning. Additionally, areas such as transfer learning (taking experience that was acquired on one task and transferring it to another) are also aspects where more progress needs to be made.



Viktoriya Krakovna

Regarding the study of the human brain; this will certainly be useful, but I don’t think that it will be absolutely necessary to simulate the human brain in order to build human level AI – to take an analogy about flying: in some ways, aeroplanes are similar to birds, but they are not copies; they don’t flap their wings – we have figured out a different way to fly.

Regarding the ethics, this is increasingly being taken into account. There has been an increasing amount of dialogue taking place over the last couple of years about both the societal impact of AI and the relevant ethical considerations, and the Future of Life Institute has helped here by organising workshops at various conferences and so on.

Many people may think of a Terminator-like scenario when thinking about X-Risk and potentially hostile AI technologies. Yet, you have taken pains to highlight that ‘the concern is not about malevolence, but about the combination of competence and an incorrectly specified model of human values or interests’. Could you expand on this?

This is an important point as there is often perhaps undue emphasis placed on the science fiction scenarios. The public, it seems, like to anthropomorphise AI and, within this, human-like emotions are often given to the technology. But it is important to understand that this would not necessarily be the case. Nevertheless, it should be emphasised that AI can still be dangerous without explicitly wanting to harm humans.

This may well be in the same way as the relationship between humans and animals exists today – humans don’t hate animals (many even love them) but on the whole humanity does a lot of harm to animals and poses a lot of danger to them (often because they are in the

Some of the remaining milestones on the way to advanced AI include things like better unsupervised learning and one shot learning while, for example, current deep learning algorithms also require more work



way, or perhaps because humans want their resource), and should we develop super intelligent AI with objectives which don't align with ours, or if it wants our resources, then that could become a serious problem.

Does this lead back to the anthropomorphisation of AI, i.e technology with the physical ability to first construct and then control a manifestation of technology capable of coming into conflict with humanity in such a way, or could this be something digital?

In the first instance, incredibly intelligent algorithms could be developed which may then go on to gain control of various actuators that would be required to achieve its goals. A super-intelligent programme that believes it requires a robotic body could use the internet and gain control of manufacturing plants and then, as the robots themselves would be online, it would also be able to take control of those in order to achieve some of its objectives.

Nevertheless, this is not an immediate concern, because human level intelligence is likely to be a few decades away.

Given that there is a clear concern that an AI that surpasses human intelligence and goes on to evolve will inevitably be developed, is there perhaps an argument that such an entity may see humanity's perceived weaknesses and inferiority as pitiful and may therefore protect us, rather than exploit us?

Even if we build a super-intelligence that is supposed to be beneficial towards humans, the most significant problem will be specifying human values to such a machine. In order to implement something simple like Asimov's Laws (a robot may not injure a human being or, through inaction, allow a human being to come to harm; a robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law; a robot must protect its own existence as long as such protection does not conflict with the First or Second Law; and a robot may not harm humanity, or, by inaction, allow humanity to come to harm), which are not particularly water tight, you would have to be able to specify what 'harm' actually is.

The Future of Life Institute has recently been expanding its scope so as to look at areas besides AI, most notably nuclear risk



A big part of the problem will be in having AI understand concepts and values such as these. If that can be done, then it could theoretically be possible to build some kind of empathy into the machine, but we cannot assume that this would happen by default; we need to discover how to make it happen by design.

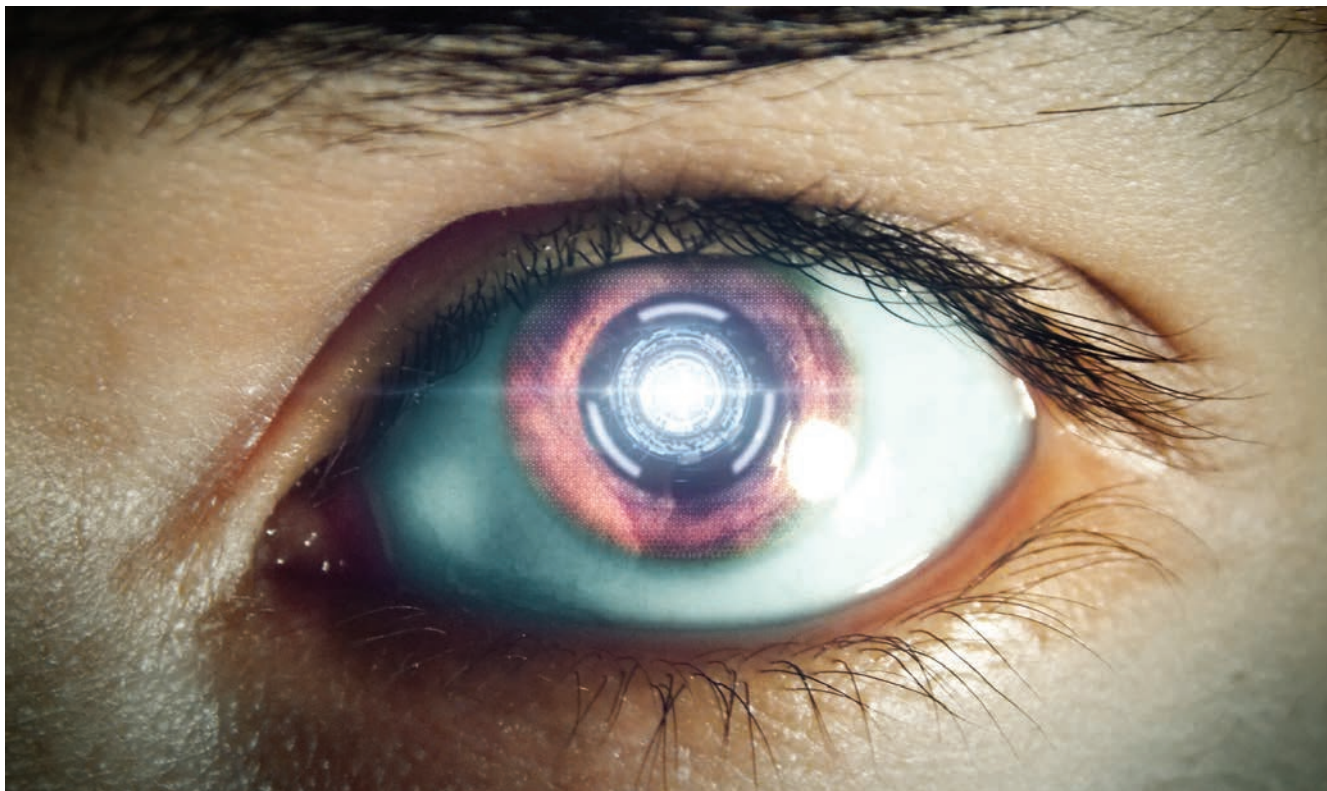
Even without trying to do that, striving to build a machine that understands these vague human concepts that are so important to our values, and despite the fact that humans like to anthropomorphise AI, it is reasonable to expect that an artificial mind would be very different to a human one. It would think about things very differently and would make very different decisions and mistakes.

Given that the kinds of risks currently considered as potential existential risks are mostly technology-related – nuclear war, AI, biotechnology – how difficult is it to ensure that an interdisciplinary approach is taken to exploring 'X-risk'?

There has been an increasing amount of interdisciplinary collaboration on these sorts of problems, and some of the workshops that the FLI have helped organise have been bringing together AI experts with lawyers, economists and people from other relevant fields who also need to think about these problems.

The issue of AI is an inherently interdisciplinary one, and so we need to bring in people from all these other fields to bring their perspective on the issue. Then, those from outside of the sphere of AI research can learn more about the technical side of things and how AI actually works, while the AI researchers will be able to better understand the social implications.

AI researchers have been becoming increasingly aware of societal issues and have seen their field feature in mainstream media around the world, often in a negative light. These scientists and researchers want their disciplines to have a positive impact – that is why people go into AI research in the first place – and are therefore actively engaging with these elements of their work so as to try to dispel some of the myths and perceived notions of AI.



The Future of Life Institute has, of course, received a significant amount of funding from Elon Musk. But do you feel more should be awarded from public purses?

The field could certainly use more funding, and we were delighted to receive the generous donation from Musk, which has enabled us to fund the first wave of projects. However, the interest from the research community was such that we received some 300 applications for the grant calls, but were only able to fund 37, and so while we are off to a good start, additional finances could certainly be put to good use.

Biotech – man-made viruses and zombie apocalypses – also feature in the public imagination as ‘end-of-the-world’ scenarios. Do you feel that this sort of technology presents more issues than AI with regard to X-risk?

It is difficult to tell which risks are more immediate than others and, while I am not an expert in biotech, it is clear that there are concerns about engineered viruses escaping from a laboratory due to human error. So there are questions about whether potential improvements can be made to lab security, for instance.

It is also the case that experts in biology are more used to thinking about the risks right from the beginning of a project or activity. What is more, the culture of social responsibility inherent in biotechnology is now being taken up by the AI community, which is a very positive development.

What role will the Future of Life Institute continue to play, and what are your hopes for the future?

We have recently been expanding our scope so as to look at areas besides AI, most notably nuclear risk. Here, we have been working to call attention to the fact that the risk of nuclear war is still high, despite the fact that the Cold War is now over.

There has been an increasing amount of dialogue taking place over the last couple of years about both the societal impact of AI and the relevant ethical considerations

In terms of public attention, we have encountered something of a polar opposite to what we find when it comes to AI, in that it is (too) easy to call attention to the risk of AI, but it is very difficult to get the press to pay attention to the nuclear issue because people often think of this risk as familiar; some people have grown up with it, and they therefore don't necessarily realise how high the risk of nuclear war continues to be or how many close calls there have been over the years. We want to attract more attention to that.

In the AI space, we will continue to foster the dialogue regarding the future of AI and its impacts both amongst AI experts as well as those from other fields. To achieve this, we have been organising workshops at various conferences as well as hosting our own events, and the sense now is that these conversations are happening at an enhanced degree and we will continue to foster this progress.

Viktoriya Krakovna
Co-founder
Future of Life Institute

<http://futureoflife.org/>





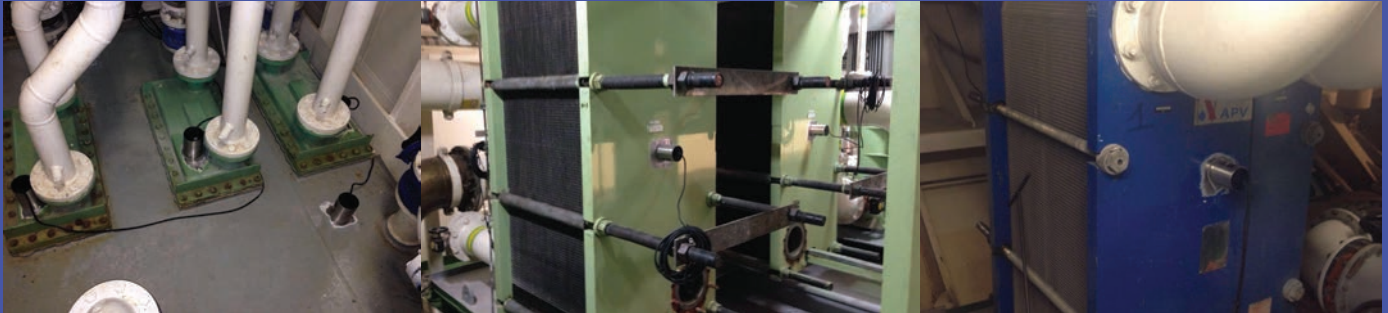
Bay House
 Bay View Road
 Port St. Mary IM9 5AQ
 Isle of Man
 UK

CONTACT

Cpt. Sven Fromm
 Managing Director
 mob: +49 (0)1522 4444479
 email: clevermarine@clevermarine.com

Lena Ruoff
 Sales / Office Administrator
 mob: +49 (0)1725 492064
 www.clevermarine.com

**NOW ALSO OFFERING THE FULL PRODUCT RANGE OF:
 HASYTEC Ultrasonic Antifouling (UTAF) Solutions**



CMS Ltd offers HASYTEC UTAF solutions which can be used for the protection of box and plate coolers, storage tanks for water, biofuels and others as well as the protection of the complete submerged structure of the vessel.

No docking and no maintenance required. Please call and make an appointment and we will be glad to present the equipment to you.

CMS LTD – FULL SCOPE OF SERVICES OFFERED:

- Overhaul and maintenance of all makes and models of diesel engines;
- Ultrasonic thickness measurement (UTM) and non-destructive testing (NDT) class approved;
- Superintendence and project management including drawing and solution services;
- ISM, ISPS and MLC consultancy and survey (pre-purchase, insurance, quality and quantity and others);
- Headhunting of marine and offshore experts; and
- Full technical management of any dry cargo, project cargo and bulk carrier vessels.



IBS Scherer GmbH has 40 years of experience in producing cleaning agents as well as parts-cleaning devices and machines. All products, whether cleaners, washing machines or devices, are 100% made in Germany and are designed and produced in an innovative, eco-friendly process.

The cleaning agents are produced using recycled cleaning agents, and the cleaning agent pumps of the parts-cleaning devices are fitted with a magnetic coupling which makes them virtually unbreakable.

Please see our website below for the full IBS Scherer GmbH product catalogue

www.clevermarine.com



From bench to bedside and back again

The Center for Applied Biotechnology and Molecular Medicine (CABMM)

The Center for Applied Biotechnology and Molecular Medicine is an official competence centre of the University of Zurich with the objective to create a stimulating environment for interdisciplinary and translational research in order to promote scientific exchange and collaborations between basic and clinical researchers.

The CABMM shows a unique structure, combining (i) a network of existing research groups interested in scientific exchange and collaboration on interdisciplinary and translational research projects and (ii) a platform for collaborative research, where basic scientists, clinicians and veterinarians work shoulder to shoulder for the purpose of developing novel therapeutic approaches for the treatment of dysfunctional and diseased tissue.

Thereby, unlike other research centres, the CABMM is not focusing on one particular medical field, but on translational and interdisciplinary aspects. Thus, the range and diversity of research being conducted within the CABMM is broad, but all research follows one aim: to facilitate the development of new treatment regimes by building a bridge between basic and clinical researchers.

Prof Dr Brigitte von Rechenberg
The Center for Applied Biotechnology and
Molecular Medicine (CABMM)
University of Zurich

Tel: +41 44 635 8410
bvonrechenberg@vetclinics.uzh.ch
www.cabmm.uzh.ch



presents

SUSTAINABLE DECISIONS

FEATURE PRESENTATION





Sustainable Industrial
Regions

Delivering Low Carbon Infrastructure

SUSTAINABILITY AND INDUSTRIAL REGIONS

Low carbon industrial regions will be essential for addressing climate change, but how do we create them?

The United Nations Framework Convention on Climate Change (UNFCCC) COP21 Paris Agreement contains an aspiration to strengthen the response to the threat of climate change and to hold ‘the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels’. In order to deliver commitments made under the Paris Agreement countries with energy and carbon intensive industrial regions cannot escape the urgent need to begin deploying the large-scale, low carbon infrastructure required for emissions abatement.

Energy intensive industries in Europe contribute significantly to jobs, GDP and the production of vital feedstock, goods and services that are essential for modern day living. Examples of the diverse range of industries include cement and fertiliser manufacture, chemicals, steel making, and man-made fibres. Economic activities dependent on these include food production, building construction, vehicle manufacture and transportation, and manufacture of household goods and clothing. In Europe, annual CO₂ emissions from industry account for more than 25% of total emissions.

Carbon capture and storage (CCS) is the only solution to reduce the CO₂ emissions created by many energy intensive industries during their operations. It is also essential for removing the emissions that come from the production of hydrogen, which is considered an important fuel for decarbonising transport and household and commercial heating. Hence, CCS will be required

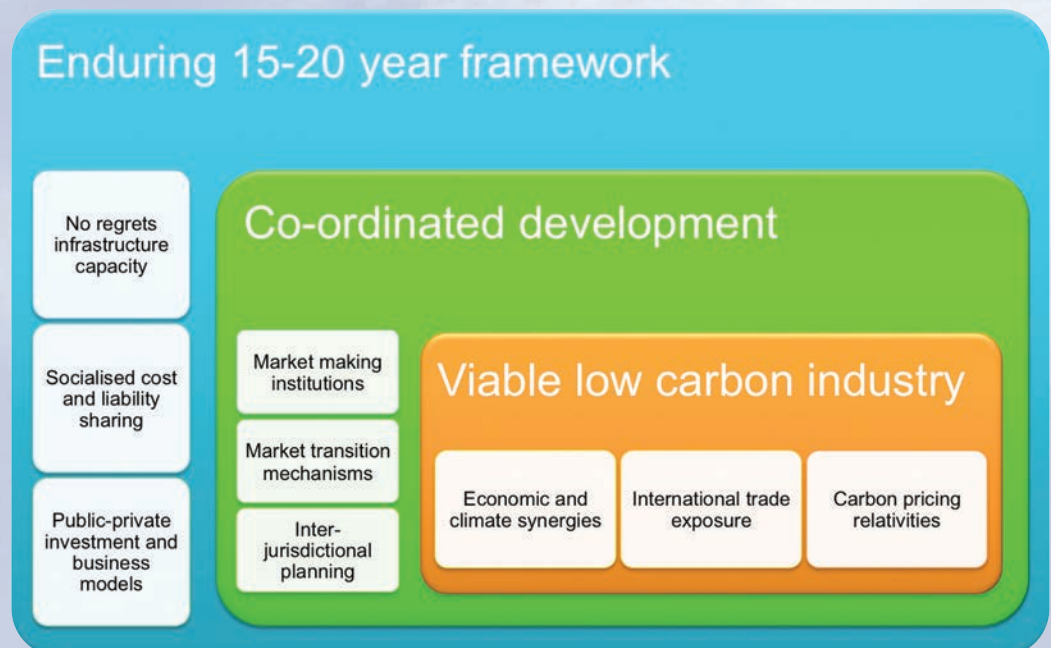
to meet even the 2°C warming scenario, and construction and operation of this infrastructure will need to occur in Europe long before 2030.

Cost and productivity competitiveness in global markets is critical for industries to remain viable and survive. Many of the energy and carbon intensive industrial companies are internationally owned, trading their products globally and having to compete at international prices. Inequalities in global carbon pricing mean that if European operations become less competitive, companies may move operations to regions where emissions control is less stringent and/or where carbon emissions penalties are lower in order to maintain their market share. This results in ‘carbon leakage’ – emissions may be reduced locally but are simply moved elsewhere and are therefore not reduced globally.

Many low carbon technologies, industrial processes and power plants cost more than conventional ones. The European Emissions Trading Scheme (ETS) was meant to incentivise low carbon investment as an alternative to paying emissions penalties, but it has not been successful and is unlikely to be so in the timeframe needed for commencing the decarbonisation of industrial regions.

Therefore a challenge facing Europe is how to create a rapid low carbon transition that ensures the viability and sustainability of the existing industrial regions, achieving emissions reductions in a way that does not adversely affect the competitiveness of these

Fig. 1 Creating an integrated policy portfolio for low carbon infrastructure



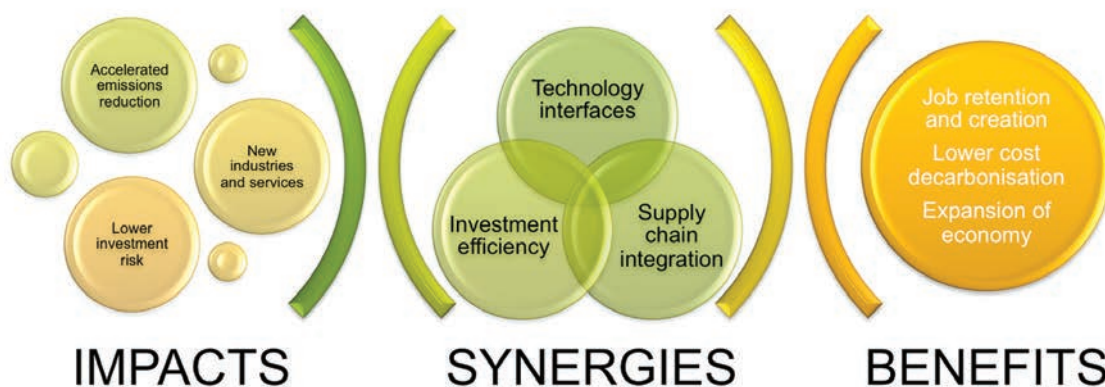


Fig. 2 Value in holistic infrastructure investment

European operations and retains the associated jobs. It must also enable economic growth through the creation of new low carbon industries that leverage the synergies between industrial CCS, CO₂ utilisation, regional combined heat and power networks, and hydrogen networks for domestic, commercial and transport use. However, there hasn't yet been any real attempt to craft the comprehensive plans, policies and market transition mechanisms required to facilitate and support the development of all this low carbon infrastructure in a co-ordinated and optimised way.

Europe's energy, economic and environmental future can only be secured through a transformation of the existing industrial regions into sustainable ones. Effecting this transformation will require governments and public authorities at all levels to work with the private sector in a more collaborative and strategic approach to the planning, design and development of new types of infrastructure based on the application of sustainable development principles at both a system and project level.

Systems versus projects

The interdependency of the impacts from the industries, the communities and the environment located within the industrial regions means there needs to be co-ordination across all parts of the physical and economic system we are trying to change to effectively establish optimal low carbon infrastructure at lowest cost while maximising social and economic benefits.

Historically the energy infrastructure serving these regions has been constructed and operated in sectors and markets essentially isolated from each other, such as gas and electricity networks. On the other hand, combined heat and power networks are an example of a synergistic approach to energy that is more cost effective and efficient. This type of design thinking now needs to be applied to novel low carbon infrastructure on a larger scale. Tackling this challenge requires the application of 'systems thinking'.

Systems thinking focuses on the 'whole' rather than the 'parts' and attempts to understand the way to generate outcomes that lead to a greater value for the whole than the sum of the value attributable to the parts. In economic terms, it is about ensuring individual projects are valued for their contribution to the greater infrastructure development rather than on individual business cases, and about creating frameworks for public and private sector decision making that lead to better selection of these projects from a portfolio of no regrets options.

Application of systems thinking to the design of new low carbon infrastructure servicing the energy intensive industrial regions means looking at 'big picture' integrated plans and valuations. This requires the consideration of how the development of the infrastructure will impact such outcomes as:

- Acceleration of CO₂ emissions abatement and reduction of environmental impacts;
- Creation of new industries, services and jobs;
- Lowering of investment risks;
- Changing energy costs for consumers, industries and businesses; and
- Creation of decarbonisation efficiencies between sectors such as transport, heating and power.

Holistic integrated policies

Given that much of the new low carbon infrastructure required for the sustainability of industrial regions will need to be built ahead of demand or full utilisation, what policies do governments have to create to ensure effective, efficient and timely delivery?

Fig. 1 shows the various components of an integrated low carbon infrastructure policy portfolio. To have full utility, the policies must be created by an holistic systems thinking approach and fit within an enduring framework over a 15-20-year period. Stability of this framework will be essential so that it can support long-term decarbonisation and sustainability objectives, public

and private sector participation, and socialisation of costs and risk sharing, while not being subject to political risk – governments changing their minds.

New business model innovation and collaboration by both government and industry will be needed for achieving the right type and level of cost efficient investment in low carbon infrastructure. This will require structuring projects in some form of public private partnership (of which there are many variants) to deliver investment models that share risk appropriately between all parties and enable rather than discourage participation of financial institutions. This should not be such a difficult ask of governments, as public good infrastructure continues to be built and replaced across the world in public private risk sharing and financing arrangements.

Working backwards from the minimum level of low carbon infrastructure required in the 2030s and 2040s (to avoid what we can think of as residual, or unabated, emissions in all of industry, power, heat and transport) will give us the low or no regrets pathway for decarbonisation plans and government support. And because low (no) carbon prices and weak future pricing signals on carbon markets create a disincentive for the investment needed to develop this level of essential infrastructure capacity, socialisation of the costs through targeted financing schemes and underwriting of risks to support individual projects will be a key responsibility of government.

Deep decarbonisation requires plans and delivery targets in time and scale. A co-ordinated approach to market development will be necessary to successfully progress deployment at the rapid rate needed to achieve emissions targets in only a few decades. New market making institutions will be required to design and implement new policies and market transition incentive mechanisms that encourage and support project development but work coherently with the policies that encourage system-level infrastructure development, and the two must create a virtuous cycle of positive reinforcement between them.

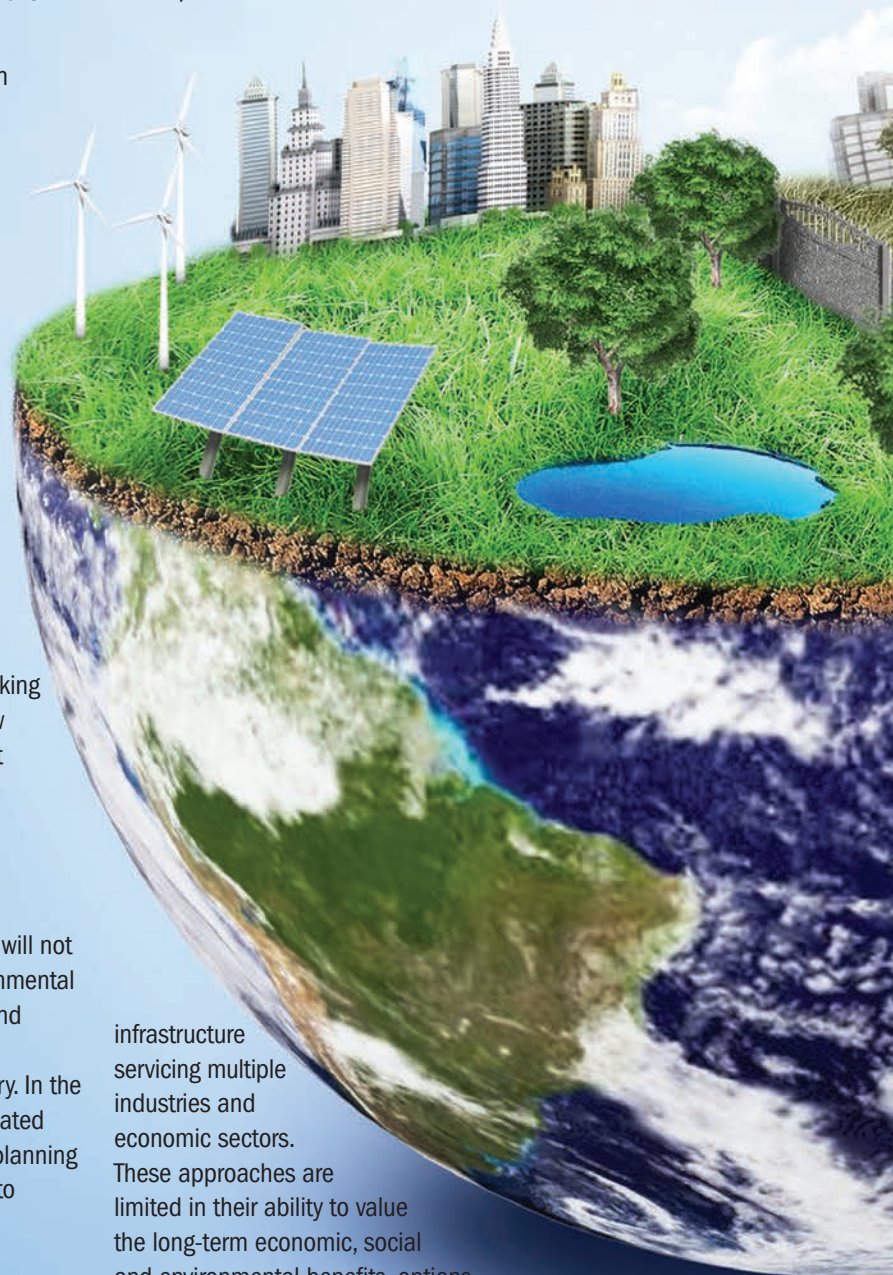
Furthermore, new low carbon infrastructure development will not stop at regional or national boundaries. Active intergovernmental coalitions will have to create and manage the strategic and delivery plans for infrastructure that will service the decarbonisation needs of more than one region or country. In the case of CCS, suitable CO₂ sequestration sites may be located outside a nation's or region's borders. Interjurisdictional planning and regulatory harmonisation will therefore be essential to successful investment, construction and operation.

Finally, the policy portfolio must address the exposure of industrial regions to international competition and different carbon price levels around the world to prevent relocation of businesses and loss of jobs. National or regional carbon pricing or emissions trading schemes are fundamentally flawed if there

is no international system of relative pricing for different economies. Trade exposed energy intensive industries will simply move to the lowest cost location. Hence, as a matter of urgency, multilateral arrangements should be negotiated that prevent carbon leakage and create a global level playing field for these types of industries and activities.

Defining value for infrastructure investments

Traditional economic appraisal techniques such as cost-benefit analyses (CBA) and multi-criteria analyses are usually a basis for public sector decision making of major infrastructure projects, but these are not broad enough to capture the full value of impacts, synergies and benefits achievable from the development of novel low carbon



infrastructure servicing multiple industries and economic sectors. These approaches are limited in their ability to value the long-term economic, social and environmental benefits, options and linkages resulting from the low carbon infrastructure investments over time. Business case appraisal is limited to revenue sources for individual projects rather than system-based value.

A good example is the current approach of valuing CCS investments in the power sector on the cost of delivering low carbon electricity using a £/MWh basis, which is then compared to alternative power generation technologies. This is neither sufficient nor helpful for driving forward policies or action on infrastructure deployment that will actually service other sectors of the economy, both directly and indirectly. A change in how to initiate, decide and implement policy using a more reasoned and holistic valuation methodology is clearly essential if the significant investment needed to deploy CCS infrastructure is to materialise in time to lower total decarbonisation costs on the pathway to 2050 emissions targets.

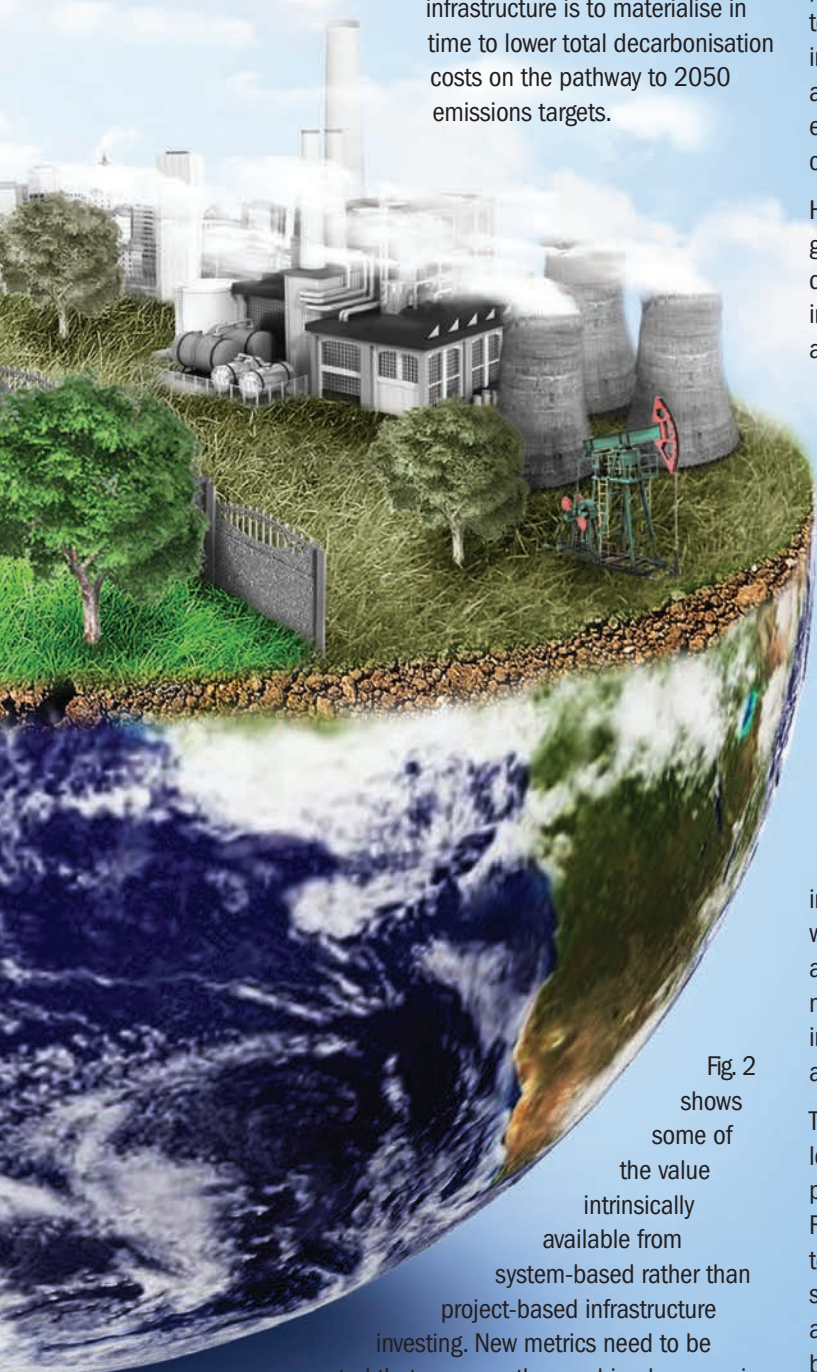


Fig. 2 shows some of the value intrinsically available from system-based rather than project-based infrastructure investing. New metrics need to be created that measure the combined economic, social, technical and environment impacts, synergies and benefits. New decision criteria based on these metrics can then be developed to effectively take account of the value of strategic real options and choices resulting from the full lifecycle and time

horizons under which no regrets but optimal integrated infrastructure deployment must occur.

Governments can create a number of positive investment and economic feedbacks that can deliver no regrets strategic infrastructure options. For example, starting with an holistic long-term regional vision based on rational and transparent criteria for a minimal level of low carbon infrastructure utilisation, and creating visibility of demand and commitment to deployment targets, it is possible to lower the investment risk perceived by investors. This in turn enables private sector capital to be attracted more competitively, which can lead to an increase in the number of low carbon investments made, thus accelerating emissions reductions and the creation of further economic benefits through expanded supply chains, new low carbon industries and services, and job creation.

Holistic value metrics and decision criteria will enable governments to rigorously allocate public funds for decarbonisation options that minimise downside loss (or increased cost). Such metrics can also help the public relate to and understand the reasons for government decisions and the policy support given to the infrastructure investments that are made.

Capacity building and regional strategies

The development and operation of all this new infrastructure as a commercial service at such large scale is not just an engineering challenge. A substantial amount of new public and private sector institutional capability is needed to successfully progress deployment at the rapid rate necessary to achieve emissions targets in only a few decades.

Novel technologies, infrastructure, commercial structures and regulations all require new governance, consenting procedures and policy frameworks that public sector institutions will have to learn and apply as essential enablers of investment, and which the private sector needs to be familiar with to undertake investment. The process of decarbonisation in a time-constrained economic system cannot rely on conventional market dynamics and requires interplay between government intervention that makes non-commercial infrastructure investible and private sector expertise to deliver individual projects.

Typically, governments, central banks and multilateral agencies look at the process of capability building in a linear fashion that parallels the 'commercialisation' process of new technologies. Fig. 3 summarises this process, wherein a new 'non-commercial' technology is assisted by policy measures and government subsidies or other incentives through research and development, and a period of demonstration, to become a competitive market bearable investment choice.

Each of the phases shown is accompanied by the acquisition of expertise and institutionalisation of regulatory, permitting and financing processes that become repeatable as the technology or economic sector matures. Of particular note is the focus on

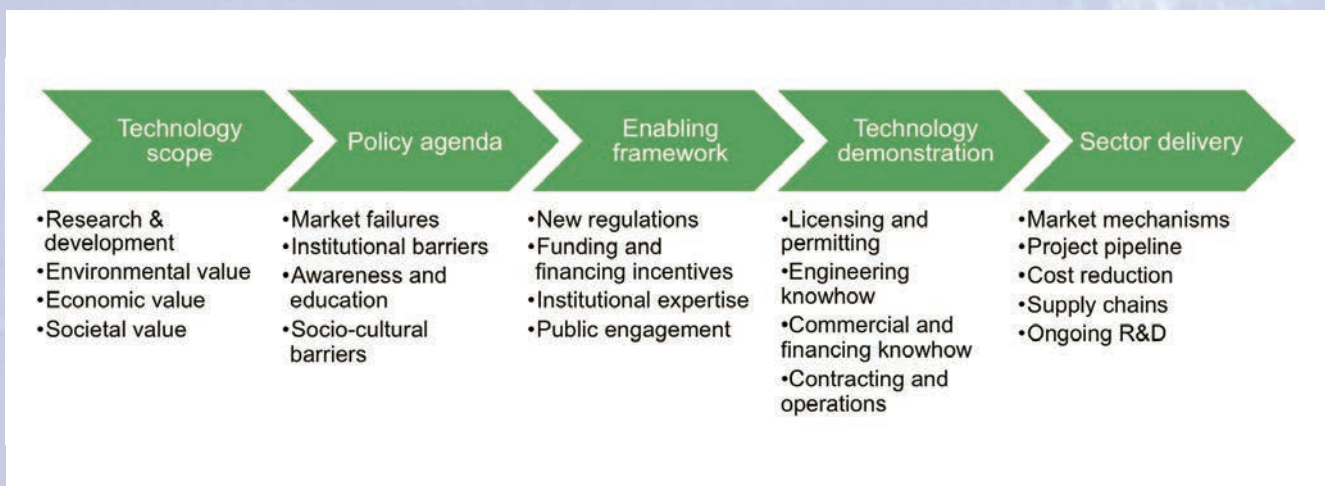


Fig. 3 Technology or sector-based capacity building

the one technology or sector and its specific market failures and investment barriers, rather than on the economic system feedbacks that occur through interactions between the technology/sector and others. An excellent example of this process has been the development, commercialisation and cost reduction of rooftop solar panels in mature energy markets. Institutional capability has grown along the way as the combination of policy and technology development has driven down costs for consumers and increased take-up rates.

Rapid renewable energy deployment has demonstrated, however, that interactions with other activities such as electricity system back-up, energy intensive industry, space heating and transport need to be managed in an holistic way if decarbonisation of the economy is going to be progressed at the least cost to the community. Climate and energy policies have to be combined into a single decarbonisation policy portfolio in order to prevent new economic externalities, market failures and barriers to achieving economies of scale with new infrastructure types.

The urgency now faced for delivering climate targets means that a different focus for capacity building tailored to this holistic decarbonisation approach has to occur. Governments and public sector institutions have to develop or enhance capability for:

- Delivering systems and networks, not projects;
- Creating integrated infrastructure synergies;
- Designing and actively managing national/regional decarbonisation plans;
- Valuing combined macro-economic and environmental benefits; and
- Decision making and support for innovation in policy and investment models.

In simple terms this means being able to answer the question: how should government prioritise and efficiently deliver the low carbon infrastructure projects that create the greatest impact in terms of economic growth, social benefits and environmental sustainability?

Fig. 4 shows the dynamic process of managing the decarbonisation of the economic system. The capability to do this includes the active management of two critical feedbacks. The first is between innovative holistic policy formulation and new technology development to ensure an optimal portfolio of real decarbonisation solution options is available. The second is between delivering the no regrets infrastructure and maximising synergies within and between sectors through co-ordinated development. In practice public sector institutions are needed that consider the 'bigger picture' and seek opportunities for greater interlinkage between infrastructure networks of different types.

The capability to transform high carbon economies to low carbon ones may sound like central planning and state intervention. However, at the heart of achieving this transition is the need for collaboration between the public and private sector. Many of the changes in the economy require investment in infrastructure projects ahead of a market demand for the more expensive low carbon alternative to business as usual.

The economic framework that governments set up for managing this will act as an enabler or barrier, depending on its effectiveness. Because decarbonisation is for the public good, and addressing climate change is essential to prevent the destruction of both economic and natural capital, socialising the cost should be seen as matter of principle. Once socialisation of costs is incorporated in the economic framework for decarbonisation it becomes possible to accelerate the deployment of infrastructure through public private risk sharing and investment models that enable private sector organisations and financial institutions to do what they do best – efficiently deploy capital and deliver operating projects.

Creating real roadmaps – linking the future to the present

The key to securing Europe's energy and economic future is the creation of regional and national energy policies that overcome the risks and market failures faced by the private sector, promote investment in the infrastructure required to meet decarbonisation

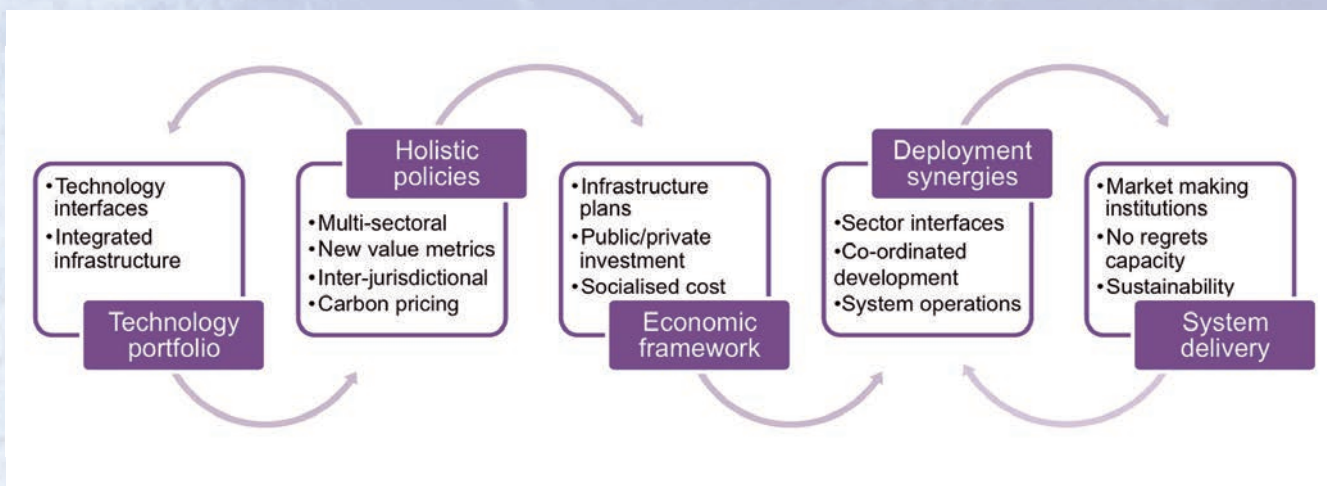


Fig. 4 System-based capacity building

targets within the industrial regions, and enable European businesses to remain competitive.

To achieve this, 2050 decarbonisation roadmaps must be designed and actively managed by governments alongside national and regional implementation plans. This requires policy makers at both regional and national levels to adopt a consultative and collaborative approach with all key stakeholders across government, the finance community, industry and local communities in order to create the enduring frameworks needed for delivering low carbon infrastructure.

This process will allow European governments to identify the interrelationships that exist between sectors rather than taking an *ad hoc* project by project approach, enabling them to decide which 'quick wins' should be prioritised, and see where integrated infrastructure synergies that create the best value opportunities, and increase the long-term value of the infrastructure, exist.

Governments will then be able to optimise their portfolio of infrastructure investments and create a no regrets level of capacity that avoids locking-in technologies which expose them to future market volatility, environmental impacts and higher costs while also increasing the macro-economic benefits of their portfolio.

The roadmaps, national, and possibly supra-national, infrastructure plans need to provide a strategic vision and a delivery framework that creates the right conditions for individual projects within a system context. In order to attract private sector capital, the national plans should include a clear infrastructure project portfolio spanning at least a decade. This will increase the market attractiveness of the project opportunities and allow investors to see the benefit of building their capabilities and expertise within the country or region.

The roadmaps and delivery plans will require underpinning by a supportive policy and regulatory environment at both national and pan-European levels that allows new commercial business models to develop which match the individual profiles and needs of the energy intensive industrial regions across Europe. In order to attract capital it will be necessary to optimise risk allocation, sharing and mitigation between the public and private sector while ensuring transparent governance and regulatory procedures. This will give investors the confidence to know they can achieve an appropriate risk-reward balance while at the same time delivering the best value for money for the public.



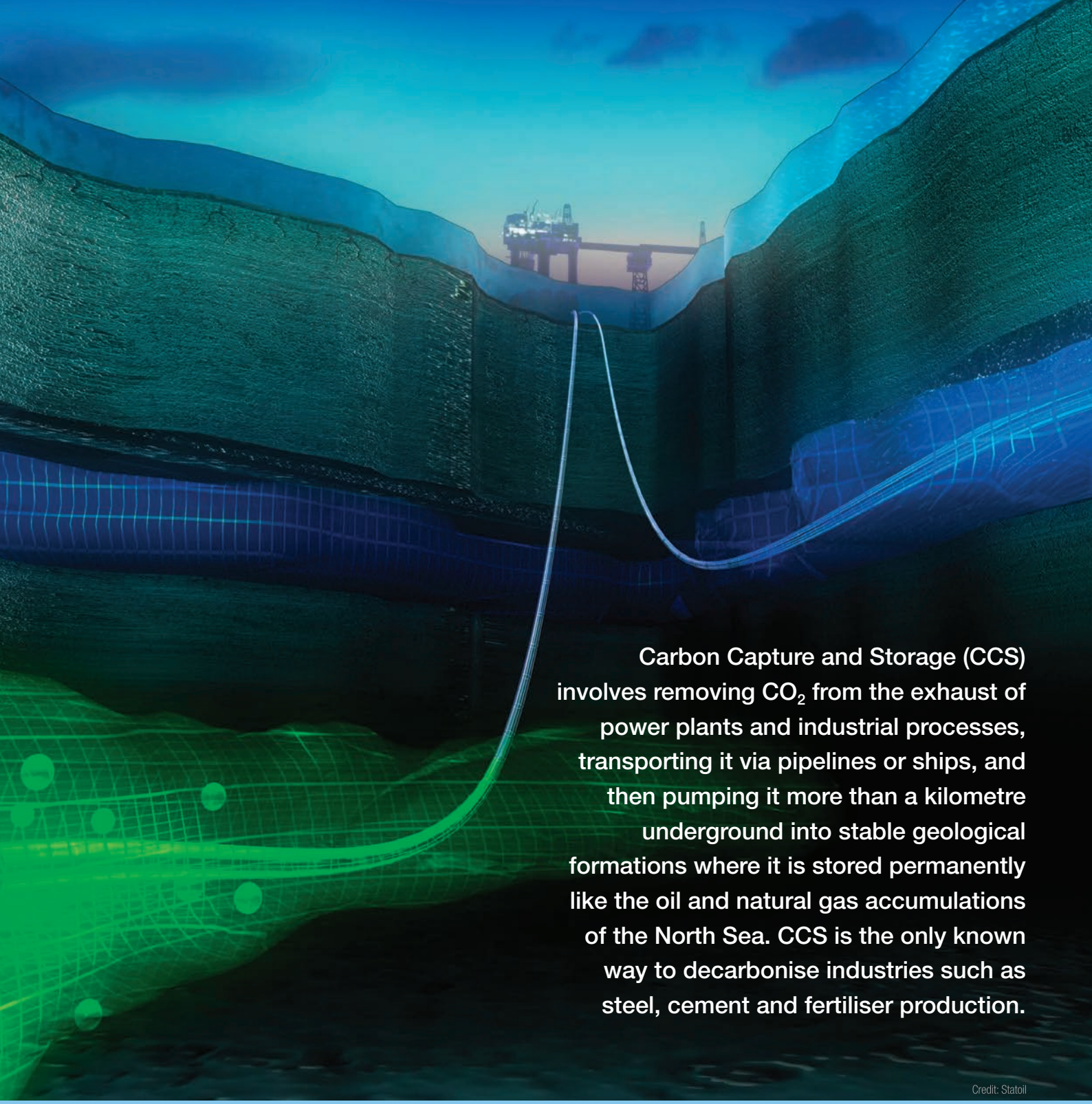
Mongstad refinery. Photo Øyvind Hagen; image courtesy of Statoil



Sustainable Decisions

Dr Ward Goldthorpe
Managing Director
Sustainable Decisions Limited

info@sustainabledecisions.co.uk
www.sustainabledecisions.co.uk



Carbon Capture and Storage (CCS) involves removing CO₂ from the exhaust of power plants and industrial processes, transporting it via pipelines or ships, and then pumping it more than a kilometre underground into stable geological formations where it is stored permanently like the oil and natural gas accumulations of the North Sea. CCS is the only known way to decarbonise industries such as steel, cement and fertiliser production.

Credit: Statoil

The Crown Estate holds the rights for carbon dioxide (CO₂) storage within the UK Gas Importation and Storage Zone (GISZ), providing leases for the transportation and storage of CO₂ in areas of the 12-mile nautical seabed and continental shelf that it manages.

www.thecrownestate.co.uk.