

Hopkins Lecture 2010

Now is the Time



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The Hopkins Lecture

Professor Paul Jowitt

President, the Institution of Civil Engineers, UK



31st August 2010

University of Canterbury/IPENZ

Christchurch

Presidential Address 2009



Now is the time

In 1997 I was privileged to have an Erskine Fellowship which enabled me to spend 6 months working with David Elms at the University of Canterbury. Chch and NZ have been an inspiration to me and it's great to be back once again. David and I spent yesterday in Akaroa. It brought back many memories. And the Oysters were excellent!

Akaroa
.. and the Giant's House

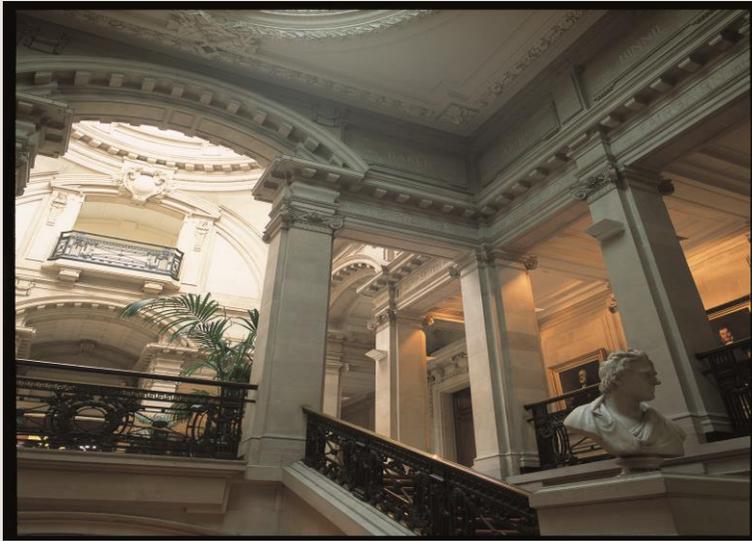


Te Puna o Waiwhetu



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Landscapes and Places that inspire. Places such the Christchurch Art Gallery - Te Puna o Waiwhetū



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ICE Presidential Address at One Great George Street

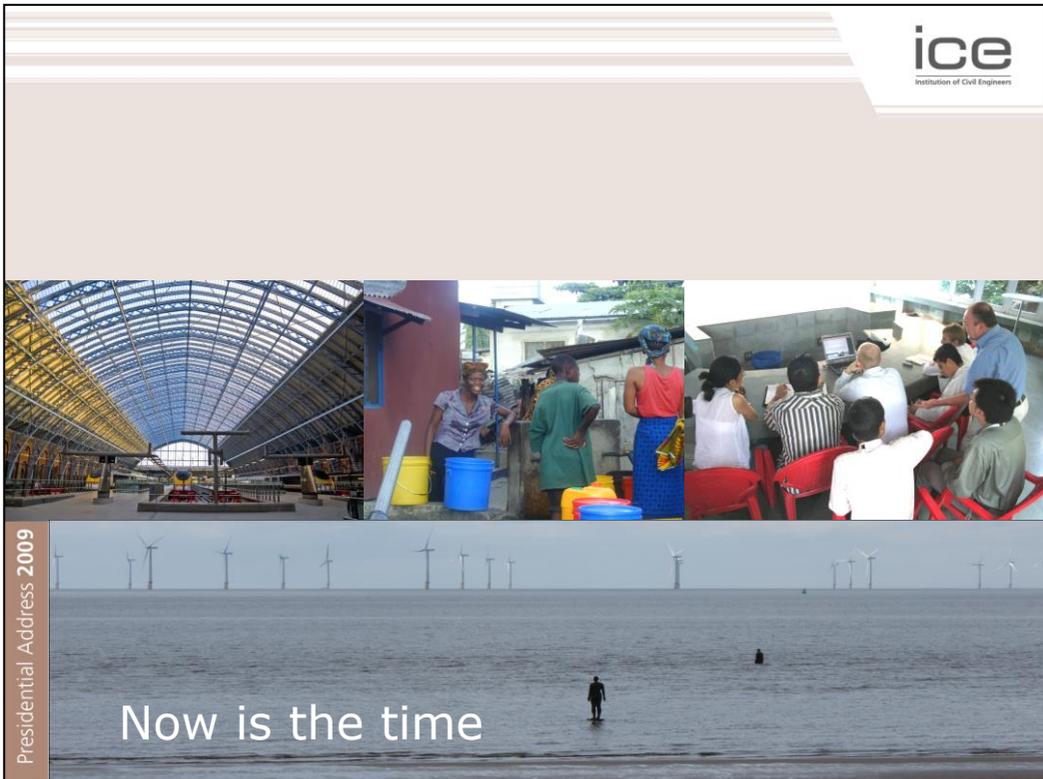
It was humbling to be in that building - One Great George Street

That cathedral of civil engineering – echoing with the voices of the great engineers of the past - whose names are carved in its Portland stone - whose portraits adorn its walls - and whose spirits inspire us today.



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It is easy to think of the 19th century as the halcyon days of civil engineering, but I put it to you today that tomorrow is the time for an engineering renaissance...



... an engineering renaissance to build and rebuild our infrastructure in a burgeoning world

... in the face of the complexities of climate change...

... in the face of a globalised economy and the fallout from the collapse of the financial systems upon which it was built,...

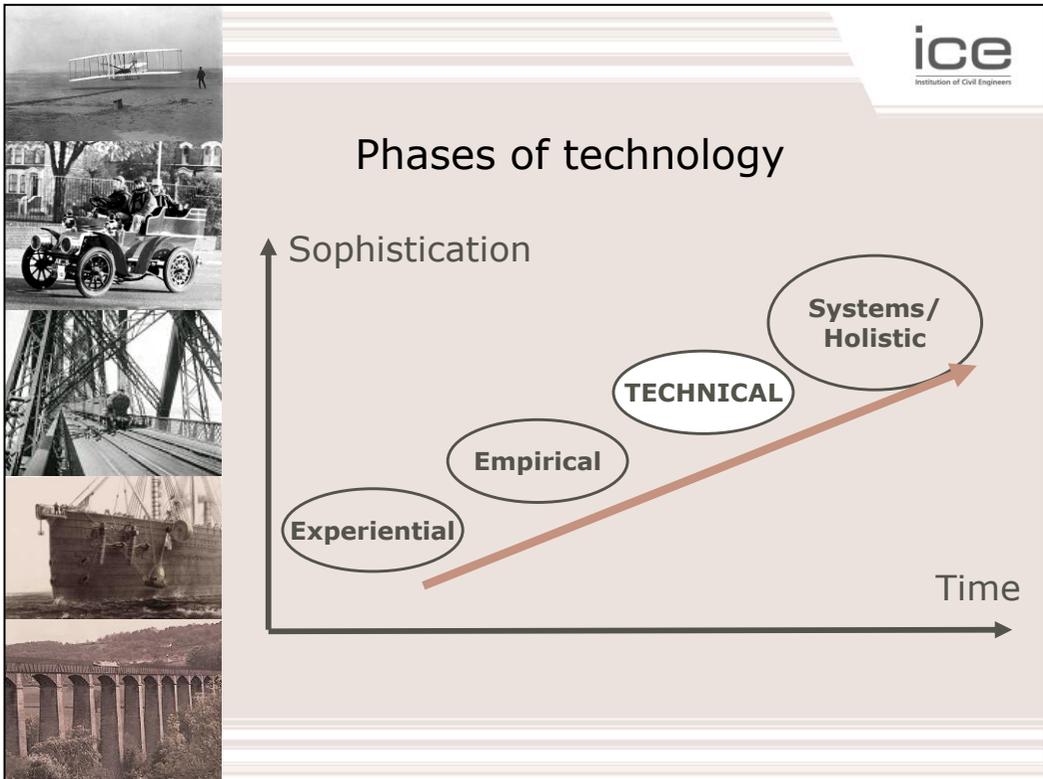
... in the face of international competition for natural resources - and in a world where more than half of the world's population have no access to the infrastructure platform upon which civilisation and its survival depends.

Yes, Now is the Time

Of course, the great 19th century heyday of engineering – that era of massive mechanisation and urbanisation - took the early Industrial Revolution from the 18th century right through into the 20th century.

From the crucible of that technological and economic powerhouse came much of the world as we see it today, with successive waves of technical innovation and periods of rapid social change.

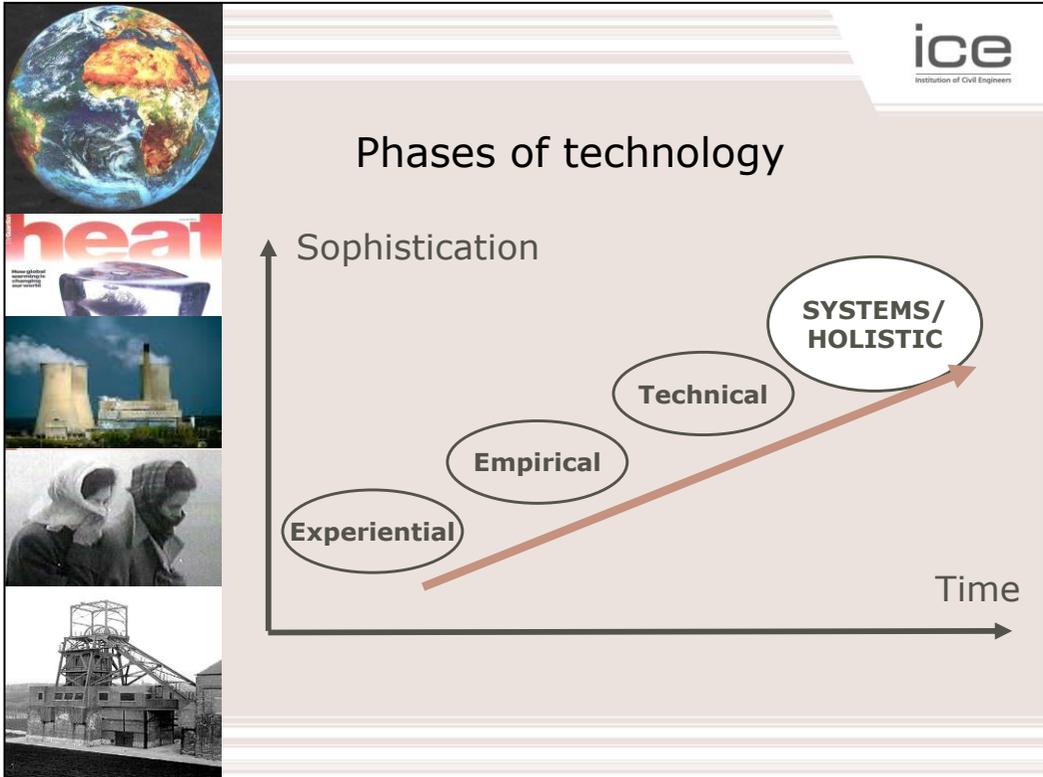
It simultaneously improved the health of a nation and the well-being of the common man - with improvements in water supply and sanitation, and greater equality of opportunity and social mobility.



From it sprang the transportation systems of canals, highways, railways and ports; the power systems; water supply, sewerage and irrigation; the production and consumption of consumer goods on a massive scale in an increasingly urbanised society;

...and the development of large-scale construction and the changing form of our cities and towns.

But from it also sprang the problems of congestion, air pollution, damage to the environment, over-abstraction of watercourses, profligate resource use and global warming



In the era of technical rationality - which has dominated the past two or three centuries or so - economic and technical progress was generally embedded in narrow technical disciplines which, - despite our scientific understanding - did not anticipate the wider physical and non-physical consequences at the **systems level**.

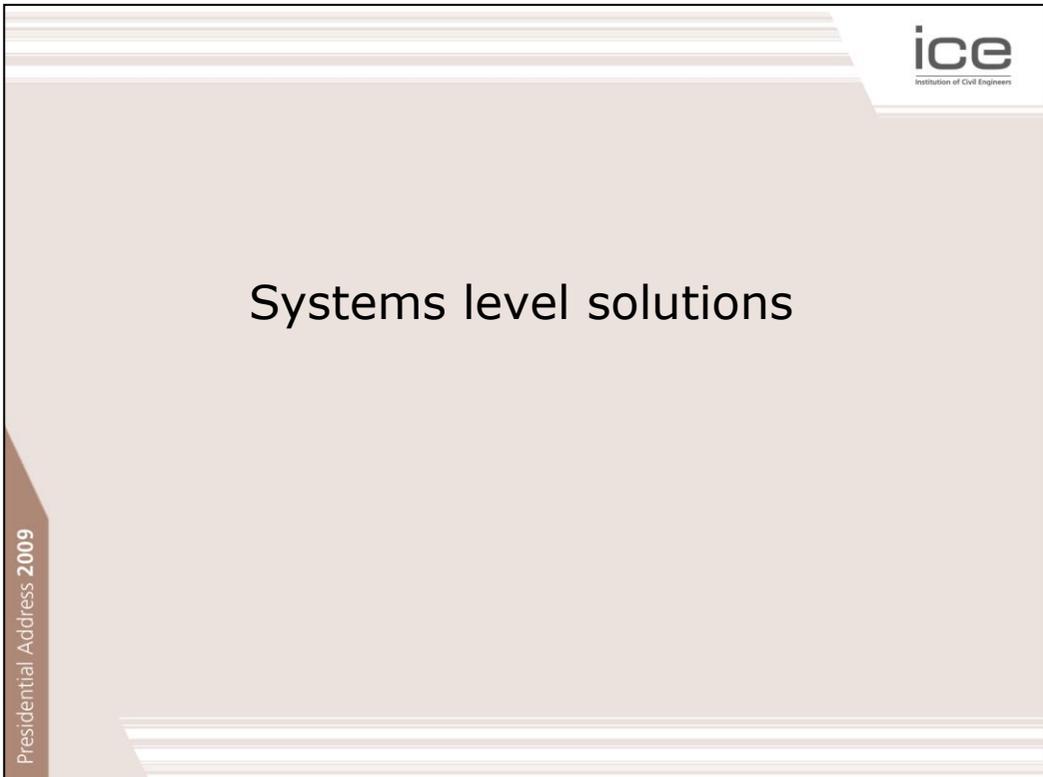
Systems level consequences

It was never anticipated that man's activities would lead to impacts on a global scale, impacts that now threaten the environment and humanity's place in it.

The emergent properties and behaviours of large and complex systems were neither fully appreciated nor fully understood.

It is now becoming clear that the earth is no longer able to withstand and rebound from human activity. It has limits. The effects are locked in.

We need – and we must – take a more systems view of the world.



There is still a long way to go in changing individual, corporate and national behaviours, but there is no doubt that we are now entering the **Systems** Phase, and with it the need to develop **systems level solutions**.

That 19th century era, that era of great engineering in the UK and the west enjoyed two advantages:

First, seemingly unlimited sources of energy – coal, oil and gas.

And second, a world of apparently boundless capacity in terms of water, food, and other natural resources relative to human need - and the false assumption that the fruits of the planet were a free good.

It was largely unfettered by the demands of democracy, planning restrictions and with little regard for health and safety.

It was funded by ambitious men of massive private wealth, easy access to raw materials from the empire and with scant regard for the rights of other nations.

Not so today. Now we know differently.

This time the scale of the problem is orders of magnitude greater.

Environmental constraints are dangerously close to being breached. There are growing international tensions for access to water, minerals and other scarce resources.

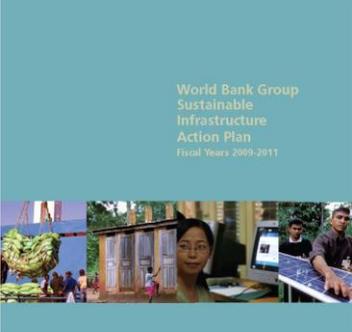
We no longer have the moral freedom to power our way into the future by burning fossil fuels.

ice
Institution of Civil Engineers

Slipping to an environmental catastrophe...

... and with

- 1 billion without access to safe water
- 1.6 billion without electricity
- 2.5 billion without safe sanitation
- 1 billion without telephone services
- 1 billion without all-weather roads

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We are slipping towards an environmental catastrophe on a global scale. And with

1 billion people without access to safe water,

1.6 billion without electricity,

2.5 billion without adequate sanitation,

1 billion without access to telephone services,

And 1 billion rural poor without access to all-weather roads.

Resolving all this will require tremendous innovation and ingenuity by engineers, working alongside other technical and non-technical disciplines.

It requires the civil engineer's ability to synthesise solutions, not simply an ability to analyse problems.

Civil engineers' ability to take a
systems view at a range of
temporal and spatial scales

It needs the civil engineers' ability to take a **systems view** at a range of temporal and spatial scales - ranging from devices and products, through to the large scale delivery of infrastructure services.

We also need to take a long-term view – and not a view where the future is discounted and where major decisions on engineering infrastructure are thwarted by blind obedience to the Treasury discount rate.

Not just a shift to whole life costs

... but to whole life **values...**

This means not just a shift to **whole life costs** but a **shift to whole life values.**

We must resolve two issues of truly global proportions

Engineering the world away from an environmental crisis

Somalia



Tewkesbury



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1. Engineering the world away from an environmental crisis caused in part by previous generations in terms of greenhouse gas emissions and profligate resource use

Providing the infrastructure platform for an increasingly urbanised world

Dhaka



Kolkata



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2. Providing the infrastructure platform for an increasingly urbanised world and lifting a large proportion of the world's growing population out of poverty

This will require a combination of re-engineering existing infrastructure and provision of first-time infrastructure at a global scale..... while simultaneously reducing carbon emissions by up to 80%.

My great friend and mentor (+David Elms'), Professor Colin Brown – and also an Erskine Fellow here at Canterbury - recently put it to me as follows:

“This is about asking engineers to engage in a process –

... It's a test of reality - not a test of laboratory.

... It's about how we decide to do this or do that – and to avoid surprise”

So now is the time...

...for a golden era of engineering to
take us safely through the rest of this
century and beyond...

Milngavie Water Works, Scotland



St Pancras Eurostar, London



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So now is the time...

... for an engineering renaissance,

... for a golden era of engineering - to take us safely
through the rest of this century and beyond

The great age of engineering is NOW.

But first let us look at the state we're in.

The state we're in –

Climate Change ...

... and a Global Economic Recession

For all practical purposes, the climate change debate is over.

The relationship between the greenhouse effect and CO₂ emissions was first postulated by Fourier in 1824. The effects were predicted in 1896 by the Swedish Nobel Laureate Arrhenius.

The debate ended with the publication of the 4th Report of the Intergovernmental Panel on Climate Change in 2007. We now know that the continued use of fossil fuels is certain to accelerate the earth's climate to a point of no return within a generation.

For the politicians who assembled in Copenhagen for COP 15 last December, it was **their** time - to agree to massively reduced CO₂ emissions and global convergence to a low carbon economy.

It was a time for them to hold their nerve and show leadership ...

The Battle of Copenhagen, 1801

Nelson: "Leave off action! Now damn me if I do."



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– just as Nelson did in the 1st Battle of Copenhagen in 1801

So now is the time for engineers to provide the solutions that will give the politicians the confidence the next time to make the right decisions... - and not to bury them.

The Battle of Copenhagen, December 2009 UN Climate Change Conference

“Contract and converge!”



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At their Triennial Conference in London in 2006, the Institution of Civil Engineers and its American and Canadian counterparts signed the *“Protocol for Engineering a Sustainable Future for the Planet”*.

ICE-ASCE-CSCE Protocol

London, 4 July 2006



This called on the three institutions to develop, monitor and implement an action plan to articulate and deliver their contribution to sustainable development, both nationally and internationally.

In 2009, at the next Triennial Conference in St John's, Canada, the three institutions agreed to a follow-up action plan on Climate Change.

ICE-ASCE-CSCE Protocol
St Johns, Newfoundland,
2 June 2009



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I was proud to be involved in drafting both of these.

The St John's Protocol acknowledged the worldwide impacts on increased exposure to flooding, reduced access to drinking water supplies – and the threats to food security in large parts of Africa, Asia and Latin America – with implications for us all.

We resolved to develop guidance to assess the vulnerability of civil infrastructure and **adaptation** measures to address those vulnerabilities.

We resolved that Civil Engineers must lead the way in developing new **mitigation** technologies to reduce emissions over the whole life cycle of infrastructure systems.

This won't be about saving the planet as such – the planet will survive in some form....

But it will be about saving humanity's place in it and those other species we'll take with us should we fail.

Remember, Noah saved biodiversity by building an ark to save it from a flood – he didn't destroy it by causing one.

The state we're in –

Climate Change and ...

... a **Global Economic Recession**

Over the past 50 years the world's economy has been built on the production, acquisition and disposal of consumer goods in an increasingly **material world**.

... the world's economy
has been built on the
production, acquisition
and disposal of consumer
goods in an increasingly
material world...



material world...



But the Material World has failed to have due regard for the underpinning infrastructure that provides the foundation upon which civilisation depends.

Existing infrastructure has been left to rot, under-funded.

Investment in new infrastructure has not been forthcoming anywhere quickly enough.

The financial systems of the past 20 years or so have shuffled money and risk around the world in ever more complex and arcane ways.

Short sellers have short-changed the public and shattered the economic foundations of the financial casinos in the process.

Now is the time for a more solid foundation and an infrastructure platform for the world.

In a searing critique of the financial sector, Lord Adair Turner, chairman of the Financial Services Authority, recently described much of the City's activities as "socially useless" and questioned whether it had grown too large. And during a recent visit to the London School of Economics, Her Majesty the Queen asked: *"Why had nobody noticed the credit crunch was coming?"*

The credit crunch

HM The Queen:

“Why had nobody noticed it coming?”

LSE, November 2008



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A response came quickly from 2 leading economists from the British Academy - Professors Besley and Hennessy, who said

“Many people did foresee the crisis...but the timing of its onset and its ferocity were foreseen by nobody”

One of the major banks, now mainly in public ownership, reputedly had 4000 risk managers.

I wonder how many were civil engineers... .. - not enough, I suspect!

Besley and Hennessy then continued ...

Professors Tim Besley and Peter Hennessy:

*“Risk managers frequently lost sight of the **bigger picture.**”*

“risk managers frequently lost sight of the bigger picture.”

And they ended by saying:

“So in summary, Your Majesty, it was a failure to understand the risks to the system as a whole.”

Professors Tim Besley and Peter Hennessy:

*“A failure to understand the risks to the
system as a whole”*

My Heriot Watt Colleague and friend, economist Professor John Sawkins makes the additional point.

“Economics has its roots in moral philosophy – in ethics.”

Policymakers set objectives - the ends. Economists advise on the means to achieve those ends

When these get mixed up, things go wrong.”

The engineers in this audience may be thinking that I am focussing too much on economics.

But unless we understand the system in which we operate, unless we engage with those who determine policy and command the economy, and unless we start to speak in the language of their discourse, then we will fail.

Remember this - when the politicking is over, it will be to civil engineers and other professions that they will turn.

"Civil engineering is the art of working with the great sources of power in nature for the use and benefit of society"

And remember too, Civil Engineering was also founded on a moral imperative...

"Civil Engineering is the art of working with the great sources of Power in Nature for the use and benefit of society"

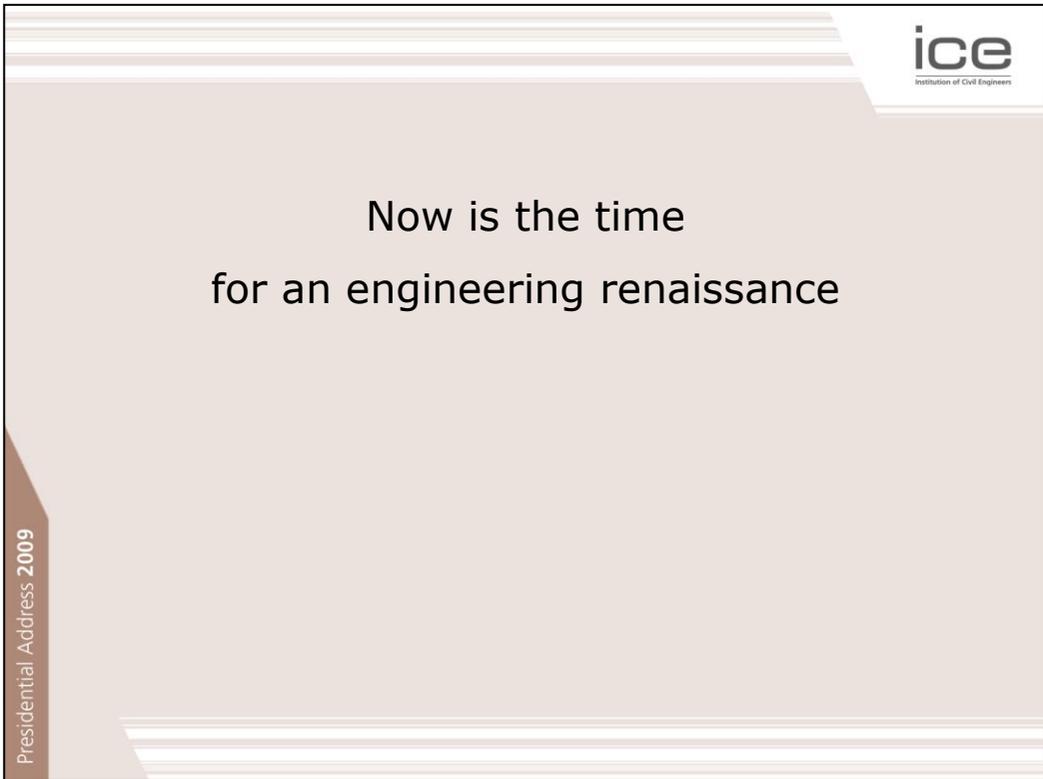
Now is the time to recapture that – not for ourselves - but to benefit the societies we serve and to influence those who set the policies that will enable us to do it.

Now is the time to ready ourselves, to make the case for infrastructure, to develop the technologies, and to inspire and prepare our young engineers to deliver it.

Now is the time
to inspire and prepare our young
engineers to deliver it

Yes, we have the imagination. Yes, we have the innovative solutions.

Now is the time for an engineering renaissance.



But there is no point in talking to ourselves in a language that others do not understand.

This is why the Institution of Civil Engineers— like IPENZ - has developed a much more intensive and focussed public affairs strategy, based on robust policy development in areas ranging from flood risk management to energy policy, from transport to waste management.

The Institution's **State of the Nation** briefings on key issues to key policymakers are increasingly very effective.

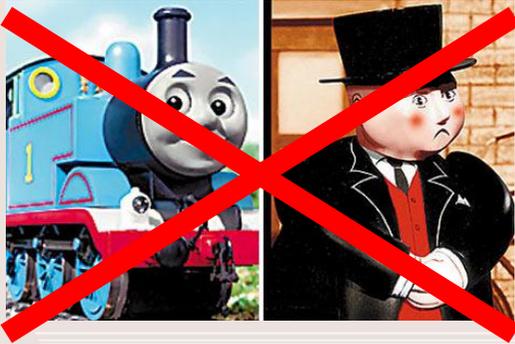
The Institution successfully pressed for the appointment of a Government Chief Construction Adviser...

~~The Big Fat Controller?~~

The Big Lean/Low Carbon Controller!

The Chief Construction Advisor!!

“A focal point for the construction sector in delivering a sustainable and low carbon economy”



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... to oversee UK construction strategy, to play a leading role in the Government's planned advisory body Infrastructure UK, and to provide a "focal point" for the construction sector in delivering a sustainable and competitive low carbon economy.

The Chief Construction Advisor

“A focal point for the construction sector in delivering a sustainable and low carbon economy”



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So, Now is the time to unleash the skills of our engineers –

- a sentiment shared by the American Pulitzer Prize winner, Thomas L Friedman, writing a piece called “Time to Reboot” in the New York Times in December 2008.

Thomas L Friedman
24 December 2008

“Time to reboot”

The New York Times

He'd taken the sleek high-speed train from downtown Hong Kong to the new airport at Chek Lap Kok to catch a flight to New York. Landing at JFK, he wrote, was like going from the *“Jetsons to the Flintstones”*. He wondered what had become of infrastructure, which was so crucial to improving the lives and productivity of millions...

... and instead *“rewarded the best of our collective IQ to people doing financial engineering rather than real engineering.”*

Thomas L Friedman
24 December 2008

*“... people doing financial engineering
rather than real engineering”*

The New York Times

He finished the piece as follows:

“John Kennedy led us on a journey to the moon.

*Obama needs to lead us on a journey to rediscover,
rebuild and reinvent our own backyard”*

Thomas L Friedman
24 December 2008

“John Kennedy led us on a journey to the moon.

*Obama needs to lead us on a journey to
rediscover, rebuild and reinvent our own
backyard”*

The New York Times

Friedman was writing about infrastructure.

This doesn't just apply to the USA. We face similar issues in the UK – and here in New Zealand.

But it's not about infrastructure for its own sake... but about infrastructure which leads to a sustainable future - about infrastructure that provides sustainable urban environments, and about infrastructure that inspires.

Infrastructure that inspires

Millau Viaduct



Eden Project



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Now is the time for practitioners - planners, architects and engineers – and the engineering research community - to work together with end users and stakeholders to build sustainable and fulfilling environments –

“Places where stuff works and people are happy”

Gateshead Millennium Footbridge



Millennium Bridge, London



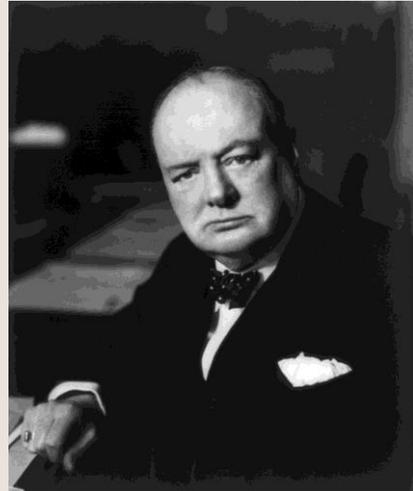
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... or to put it more bluntly, “to make places where stuff works and people are happy”.

It was Winston Churchill who said:

*“We shape our
buildings,
and afterwards our
buildings shape us”*

Winston Churchill



“We shape our buildings, and afterwards our buildings shape us.”

Now is the time to shape our cities for future fulfilment.

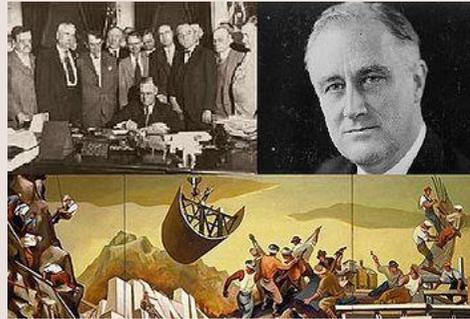
And despite the economic situation ... Now is the time to invest in the critical infrastructure that inspires

In the 1930s, the response to the economic depression in the USA was Roosevelt’s New Deal – was investment in critical infrastructure, such as the Grand Coulee and other hydropower dams on the Columbia River.

Roosevelt's New Deal

Response to the Great Depression in the 1930s

Grand Coulee Dam



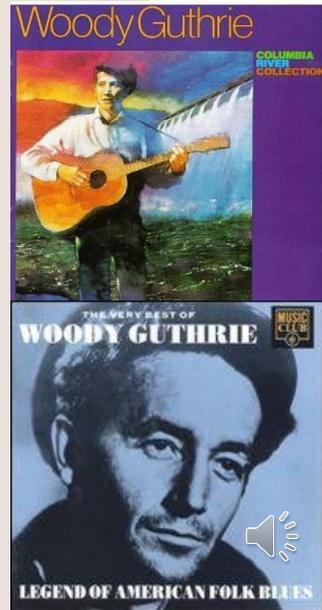
The folk singer Woody Guthrie was hired by the US Department of the Interior to write songs about the Columbia River scheme. He was inspired to write "26 songs in 28 days", including three of his most famous: *"Roll On Columbia"*, *"Pastures of Plenty"*, and *"the Grand Coulee Dam"*...

Of the Columbia River and the Grand Coulee Dam, Guthrie sang:

*"...Roll along Columbia,
you can ramble to the sea*

*But river, while you're rambling,
you can do some work for me"*

Woody Guthrie



"Roll along Columbia, you can ramble to the sea,

*But river, while you're rambling, you can do some work
for me.*

And there are massive opportunities today to power the future using renewable technologies, not least those that can exploit wave and tidal energy, harnessing the great sources of Power in Nature...

"Harnessing the great sources of power in nature..."



SALTIRE PRIZE
Scotland's Energy Challenge to the World



www.saltireprize.com

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Woody Guthrie also wrote *"This land is your land"* – and so it is.

Now is the time for sustainable infrastructure which inspires us - and which sustains us.

Now is the time to rebuild our economic systems and re-invest in our infrastructure - and future proof it against climate change and catastrophic systemic failures from natural and other sources.

It is bad enough when infrastructure fails through natural causes. It is unacceptable that it should fail by neglect.



The Institution's recent State of the Nation report on Critical Infrastructure called for the establishment of a new single point of authority for infrastructure resilience.

The Institution called on the government to revise the remit of sector regulators, such as Ofgem and Ofwat, to include responsibility for asset resilience as well as consumer interests. Regulatory cycles of 4-5 years are out of step with asset lifetimes of 25-50 years.

The regulatory drive to reduce the operating costs of our key utilities encourages the adoption of maintenance regimes based on "just in time" strategies, rather than "just in case".

So it's vital that we understand the potential impacts of the failure cycle and its societal context. We need to manage infrastructure lifelines in all phases of their lifetimes.

It all comes back to systems!

Let us remember that civilisation - a functioning society and business - depends on a series of complex infrastructure networks, providing our cities and towns with clean water, transport, energy and the capacity to trade efficiently.

But this complexity also makes these networks vulnerable. And when infrastructure fails, things go wrong.

The risks of infrastructure breakdown – and the scale of its consequences - are increasing from a range of random and non-random sources, including climate change, potential over-dependence on high technology infrastructure, and increasing urbanisation (in both the developing and developed worlds).

The waters might be muddied but issues are crystal clear: Nature is a great leveller.

Criticality and vulnerability of civil infrastructure

New Orleans

Hull

Andhara Pradesh

Rotherham



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We saw it when Hurricane Katrina hit New Orleans in 2005. A few simple civil structures failed - some flood levees. Eight hours later, the social cohesion of a city in the world's richest and most advanced country was reduced to chaos. No electricity, no ATMs, no cash, and therefore an inability to buy food or water.

In the UK we saw it with floods in SW England, Yorkshire and Scotland. Loss of homes, people camping out in their driveways to protect their shattered properties and remaining possessions.

Some wouldn't return to their homes for over 12 months. Some still haven't.

Criticality and vulnerability of civil infrastructure

Pakistan



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But all these are dwarfed by the recent
flooding in Pakistan.

We saw it with the earthquakes in China,
Pakistan, Italy and just recently in Indonesia

Criticality and vulnerability of civil infrastructure

L'Aquila

Haiti

Aceh/Sri Lanka

Samoa



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We saw it with the Tsunami in 2004 in Indonesia, Sri Lanka, and India, and again just recently in Samoa.

Thousands dead, thousands displaced – loss of homes and livelihoods.

Criticality and vulnerability of civil infrastructure

London



Madrid



Mumbai



New York



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We've seen it as a result of terrorist events – the World Trade Centre, the London Tube Bombings, Madrid, Glasgow and in India, Pakistan, Iraq and Afghanistan. Severe loss of life, economic damage, massive disruption to transport and communications systems, mobile phone networks swamped.

All this shows that we are only hours away from social collapse if critical infrastructure fails.

Now is the time to look at the bigger picture – in terms of timescales, in terms of connecting disciplines, in terms of whole world thinking, in terms of **systems**.

The bigger picture – in terms of timescales, connecting disciplines, in terms of **systems**

... creating **systems** that work

Engineering is not just about building artefacts, but about creating **systems** that work.

The prevailing Western and North American view of science and technology has been essentially reductionist, which doesn't encourage a systems or holistic view of the world.



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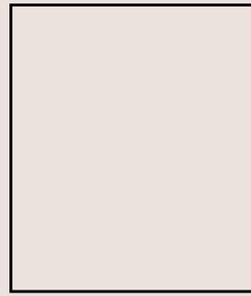
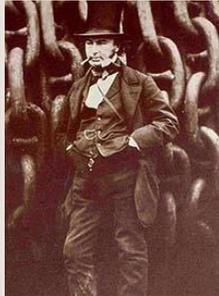
As we enter what has also been called the Ecological Age, civil engineers need to adapt and learn from other disciplines and from other cultures that have a much closer relationship with the world in which we live – the American Indian, the Celt, the Inuit, the Aboriginal, the people of the Masai Mara, and the Maori.

Telford (1757)

Brunel (1806)

Hawksley (1807)

??



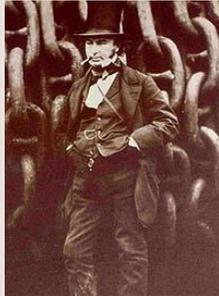
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In recent years we have justly and proudly celebrated the anniversaries of great engineers – Telford’s 250th Brunel’s 200th, Hawksley’s 200th.

This year is the bicentenary of Charles Darwin – one of the first systems thinkers – at least in “Western” philosophy.

Charles Darwin – one of the first systems thinkers...

Telford (1757) **Brunel** (1806) **Hawksley** (1807) **Darwin** (1809)



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As civil engineers, we need to develop systems level solutions to enable us to give better advice and to arrive at better decisions.

Systems level understanding...

...leading to **better decisions**

We need to distinguish between complexity and complicatedness... To distinguish between those things that are rich in structure compared to those which are just rich in detail.

We need to tackle issues of land use planning, urban regeneration and transport as parts of the same system. In terms of transport, we need to see different travel modes as complementary, not competing alternatives leading to all manner of undesirable and unintended consequences at the systems level.

In terms of water and water resources, now is the time to stop thinking of water as just another commodity.

21st century challenges

“The Perfect Storm...”

Prof John Beddington
Chief Scientific Advisor
UK Government

- Urbanisation
- Population
- Food security
- Poverty alleviation
- Energy demand
- Climate change
- Water demand
- Counter-terrorism
- Infectious diseases
- Biodiversity

In a recent presentation to the ICE Council, the Government’s Chief Scientific Advisor, Professor John Beddington outlined ten 21stc Challenges as the “perfect storm”

- *Urbanisation*
- *Population*
- *Food Security*
- *Poverty Alleviation*
- *Energy Demand*
- *Climate Change*
- *Water Demand*
- *Counter terrorism*
- *Infectious Diseases*
- *Biodiversity*

I’m not sure the term “perfect” best describes the desirability of the outcomes, but I know what he meant...

These challenges are not independent – they are interconnected.

They are the emergent properties of large-scale, complex systems.

Systems level solutions!

- Urbanisation
- Population
- Food security
- Alleviating poverty
- Energy demand
- Climate change
- Water demand
- Counter-terrorism
- Infectious diseases
- Biodiversity

.. the **emergent properties** of large-scale, complex systems...

Civil engineers have a positive role to play in addressing all of these...

And one way or another, civil engineers have a positive role to play in addressing all of these – by dealing with the underlying systems...

This is our job

More to the point, John Beddington and others in Government increasingly recognise that too – they realise the role of the civil engineer and are ready to listen.

Earlier this year John Beddington encouraged the Royal Academy of Engineering and the Institution of Civil Engineers and CIWEM to produce a report on the key issues of water security.

ICE-Royal Academy of Engineering Workshop on Water Security

- Water resources and urbanisation in Asia
- Agriculture in Sub-Saharan Africa
- Sustainable water resources development in Europe

Recurrent message – the need to adopt a **systems** approach to water security

The report covered water resources and urbanisation in Asia, agriculture in Sub-Saharan Africa and sustainable water resources development in Europe.

But the recurrent message that emerged was the need to adopt a systems approach to water security - to develop a systems-level understanding to enable better decision-making.

Water security is not confined to the UK, but spans the world. Rivers and aquifers don't respect national borders and this has the potential for international conflicts. Not least in the Middle East, in Africa, and in the Indian sub-continent.

As Mark Twain once observed – whiskey is for drinking, but water is for fighting over

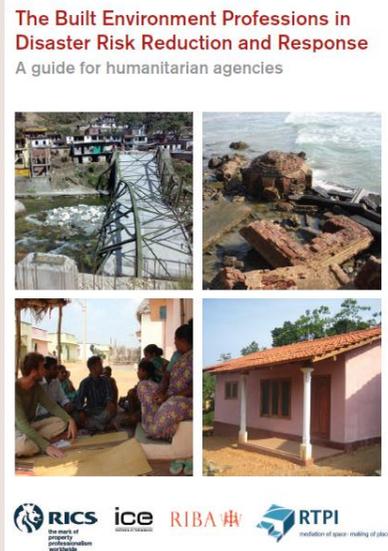
*“Whiskey is for drinking
but ...
Water is for fighting over...”*

Mark Twain

The criticality of infrastructure is not confined to the developed economies of the world.

Disaster risk reduction

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The effects of climate change and the fallout from political strife add to the catalogue of disaster relief work. The ICE has long been a supporter of RedR – the Register of Engineers for Disaster Relief – an organisation started by my friend and former ICE VP Peter Guthrie.

Darfur



There is hardly a place in the world where engineers from RedR have not been deployed in the wake of some disaster or another to bring humanitarian relief. Re-establishing - or establishing from scratch - the fundamental human requirements of water supply, sanitation, power, shelter, food and medical supplies and other essential services. But what makes the work of RedR engineers so special is that they do it in such difficult and often harrowing circumstances.

They do it on demand, at the drop of a hat.

And through their sweat and their skills, RedR engineers have become an inspiration for a whole profession.

But civil engineers also need to be proactively involved in International Development, not just responding to disasters after they've happened.

International development



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Effective economic recovery and sustainable development will also depend on extending infrastructure to those in the world who have been left behind in the past 50 years and who will be exposed to even greater threats in the next 50 years.

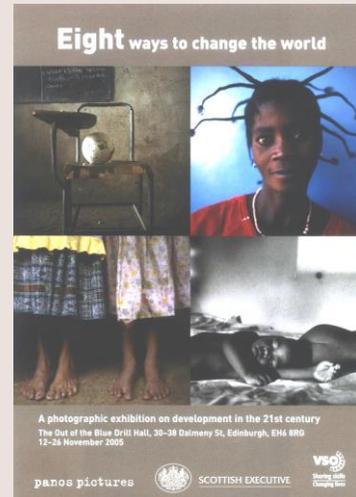
The world's population is now over 6 billion and set to rise to 9 billion by 2050. Urbanisation is increasing apace. There is a tide of humanity heading from the countryside to the city. Tens of millions per year. The demand for effective infrastructure services is immense.

Progress towards the UN Millennium Development Goals is behind schedule - and the global economic crisis has had grim repercussions.

And the consequences of climate change – sea level rise, changes in rainfall patterns, drought and flooding – will impact most on the most impoverished people of the world...

The UN Millennium Development Goals

1. Reduce extreme poverty
2. Increase primary education
3. Increase gender equality
4. Reduce child mortality
5. Improve maternal health
6. Reduce HIV/AIDS
7. Increase environmental sustainability
8. Develop global partnerships



The first six of the eight UN Millennium Development Goals are directly concerned with the human condition – their physical health, their economic and social well-being and their capacity to play a full and useful role in the world.

And this all depends on access to infrastructure.

The other two UN MDGs relate to the environmental limits within which we have to operate - and the partnerships we need to build - to deliver the infrastructure upon which civilisation depends - infrastructure that achieves real, pro-poor outcomes in the process of its planning, construction and operation.

Lack of access to basic infrastructure is at the root of world poverty and the human tragedies associated with it.

Many communities are marginalised with little access to even the most basic of infrastructure, education and healthcare, and tenuous legal tenure to land or property.

In the massive Kibera township in Nairobi, the people are exploited, with most of the dwellings owned by private landlords and where the payback period is 9 months.

Yet even in Kibera, community groups are bettering their community - by constructing toilet blocks and running a maternity unit, assisted by aid funds and personal subscriptions of a few Kenyan shillings per month.

In their overcrowded classes, the school children are attentive and smartly turned out.



In her schoolbook this 8-year-old girl writes in neat handwriting that cutting down trees is bad for the environment because it leads to soil erosion - and yet much of Kibera relies on fuel wood for cooking.



That 8-year-old girl is taking a systems view

And even in the emerging economies of such as India and Brazil, there is scant evidence that the underclasses are benefiting significantly from their countries' transformation into technologically driven powerhouses.

Most are still living in what are euphemistically called 'unplanned settlements': slums.

From Mumbai to Nairobi, from Cape Town to Rio, the urban landscape is scarred by amorphous, slum-grey shanty towns, built from whatever materials come to hand, with water courses polluted by sewage and solid waste.

Slum-grey shanty towns



Presidential Address 2009

The solutions today are deceptively straightforward - the provision of basic urban infrastructure and effective infrastructure services.

Politicians and economists have never delivered infrastructure. But they can will the means.

Ultimately, it is down to the engineers working with and within the communities in need.

Now is the time for an engineering vision for delivering the UN Millennium Development Goals

International development

Now is the time for an engineering vision for delivering the UN Millennium Development Goals

It is not the time to turn away and ignore the problems

It's not the time to "Put the cat out and close the door...".

There are certain prerequisites for development, without which attempts to improve livelihoods in the developing world will be unlikely to succeed.

Prerequisites for development...

Reasonable governance structures

A functioning civil society

An effective local economy

Freedom from persecution, conflict and corruption

These include reasonable governance structures; a functioning civil society; an effective local economy..., and freedom from persecution, conflict and corruption.

The Institution and the charity Engineers Against Poverty are partners in the DfID-funded Construction Sector Transparency Initiative.

(<https://engineersagainstopoverty.org/> , <https://infrastructuretransparency.org/>)

The project is being piloted in Tanzania, Zambia, Vietnam and the Philippines. It is tackling problems of corruption and shoddy workmanship in construction to ensure that government funded construction projects are delivered on time, at high quality and at a reasonable price.

Exactly the same values and expectations that we would expect in the developed world.

A functioning local business sector can also reduce poverty through direct involvement in the development of effective and sustainable infrastructure, providing an internal demand for local skills and employment.

This is exemplified by the work of Ron Watermeyer - former President of the South African Institution of Civil Engineering. Watermeyer was seconded to the South African government in 1995 and led Soweto's contractor development programme. He was closely involved in community-based job creation programmes and the development of local engineering businesses and enterprises.

Ron Watermeyer



Soweto



Presidential Address 2009

Now is the time to work with our engineering colleagues across the globe to build the engineering capacity to create the infrastructure services to deliver the UN MDGs.

And if we are successful, the lessons learned by **that 8-year-old girl in Kibera** will have been worth it and put into practice. She might still be at school in her teens, her family part of a recovering local economy, her community less at risk from disease from poor wastewater disposal and fetid solid waste. Perhaps she will go on to college and become part of the infrastructure delivery process.

But infrastructure delivery also requires investment.

International development



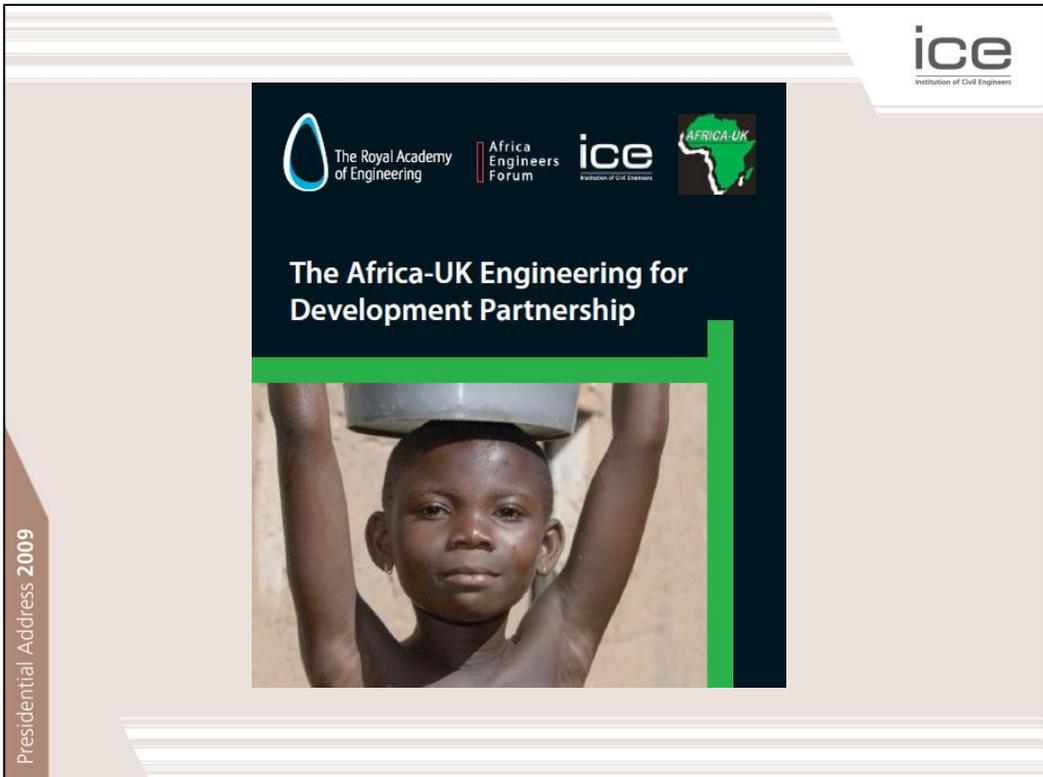
Presidential Address 2009

Those mired in poverty do not have - and cannot afford all the resources necessary to resolve their plight. They will need external investment from business and the international agencies, and assistance from the worldwide engineering community.

There will be no spectators as the future unfolds.

But there are particular roles for civil engineers.

The Institution is doing all it can to build engineering capacity at the international scale. The ICE is working with the Royal Academy of Engineering, the South African Institution of Civil Engineering and the African Engineers Forum to build engineering capacity in Africa.

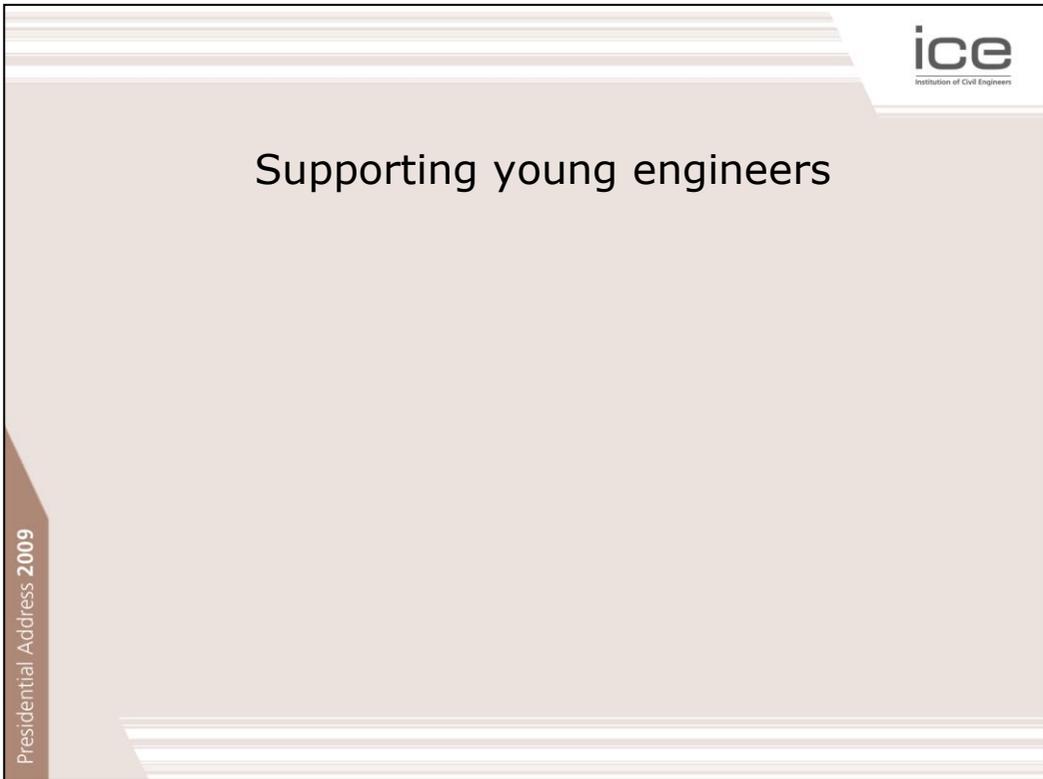


We are working with UNESCO and Engineers against Poverty on university curricula for engineering for international development.

We are in contact with senior officials at DfID – UK Aid – and with politicians from all parties to pursue all these initiatives.

We are close to agreeing a memorandum of understanding with Engineers without Borders, RedR and Engineers against Poverty to bring closer cooperation on international development.

And in Commonwealth week last March, the Institution hosted a major conference on international development and engineering capacity building.



The current state of the economy is having profound effects on civil engineering – and civil engineers. We know that many civil engineers have lost their jobs, and the recruitment of graduate engineers has slowed. IPENZ meeting in London – many young engineers returning to NZ....

But Now is not the time to lose a generation of young engineers

Supporting young engineers

Now is the time to inspire them,
and allow them in turn ...

... to inspire us – through their
passion, their values and their energy

Now is the time to inspire them, and allow them in turn to inspire the rest of us through their passion, their values and their energy

Encouraging young engineers of the future



Presidential Address 2009

Now is the time to encourage, nurture and support the engineers of the future...

We must do this throughout the engineering professions – individually as role models, corporately through the engineering industry and professionally through the ICE.

The Graduates and Student members of the Institutions are our lifeblood.

Supporting young engineers

EFOD

Engineers for
Overseas Development



EWB

Engineers
without Borders



Mondialogo Awards

UNESCO Daimler
Mondialogo Awards



Presidential Address 2009

Many of our graduates are members of Engineers for Overseas Development – an initiative designed to “assist in the development and training of graduates by challenging them to undertake projects that improve public health in developing countries” <https://www.efod.org.uk/>

Many of our younger members are also members of Engineers without Borders – a student led charity established to ‘facilitate human development through engineering’. <https://www.ewb-uk.org/>

At the international scale, many engineering students from the developed and developing worlds are taking part in the Mondialogo Engineering Awards, developing engineering projects to address the UN MDGS.

I am lucky to be a member of the Mondialogo Jury and have witnessed first-hand the way in which young engineering students work together – crossing boundaries, disciplines, nationalities and cultures.

Truly Engineers without Frontiers.

Now is the time to give our young engineers all our support and encouragement.

One of the ICE’s distinguished Past Presidents, Thomas Hawksley, made some very pertinent observations about supporting young engineers in his Presidential Address. They are worth repeating.

Thomas Hawksley



Presidential Address 2009

Hawksley said this:

“On the subject of professional education, I would say to the Students - Of all things, don't attempt too much”

He advised them to maintain their skills in mathematics and engineering science, to develop their language skills and to keep up to date with cognate subjects. He advised them to:

- Practise as much as possible the art of mental computation, for this would give them the means of almost intuitively arriving at the best of several alternative plans or methods.
- Develop a knowledge of form and function.
- Develop an understanding of practice, adding that this knowledge is not to be obtained in a school, a college, or an office.

He said : *“Don't be afraid of soiling your hands or dirtying your boots, but be in every other respect – in thought, feeling, and conduct – a gentleman”*

This was before we had a female President!

What he meant was to be well-mannered and considerate with high standards of proper behaviour)

A few years ago I led a Task Group to define the ICE's sustainable development requirements in civil engineering degree programmes. I wish I'd read Thomas Hawksley's Presidential Address beforehand. It would have saved some time. Fortunately, we didn't get it wrong.

Our conclusions were in line with Hawksley's advice - to balance engineering knowledge – both theoretical and practical – with a disciplined body of general knowledge, and the need to develop skills of discrimination and judgement through close observation of sound engineering practice.

Systems and sustainability

“To balance engineering knowledge – both theoretical and practical – with a disciplined body of general knowledge, and the need to develop skills of discrimination and judgement through close observation of sound engineering practice”

A systems view ...

Hawksley concluded his address as follows:

“I shall be happy to afford to the Students of the Institution all the opportunities in my power;

... if they will do me the pleasure to accept an invitation to visit the Leicester Waterworks, which combines in itself the storing, the gravitation, and the pumping systems, I shall be only too glad to make all the necessary arrangements.”

A very good thing to do too – and a smart move – and not a bad way of recruiting the best students!

The role of mentoring the next generation of engineers is vital and this is reflected in many companies’ ethos today - knowledge sharing, is vital for global engineering organisations.

Thomas Hawksley was an engineer committed to the provision of public services, to the provision of the underpinning infrastructure upon which civilisation depends, and committed to developing the next generation of engineers to deliver these goals.

Like Joseph Bazalgette, he was an engineering hero then, and he would be a hero now.

Engineering heroes

Joseph and Josie

In both the ICE Presidential Commission “Engineering without Frontiers” and the ICE’s 6th Brunel International Lecture “Engineering Civilisation from the Shadows”, I compared The Times obituary of Bazalgette in 1891 with what might be written in 2025 - when the final reckoning is made about our progress towards meeting the Millennium Development Goals.



Joseph Bazalgette

THE  TIMES 16 March 1891

That great, far-sighted engineer, who probably did more good, and saved more lives, than any single Victorian public official.

When the New Zealander comes to London, a thousand years hence, to sketch the ruins of St Paul's, the great granite blocks which form the wall of the Thames Embankment will still remain to testify that, in the reign of Victoria, 'jerry-building' was not quite universal.

Of the great sewer that runs beneath, Londoners know, as a rule, nothing, though the Registrar-General could tell them that its existence has added 20 years to their chance of life".

Of Joseph Bazalgette, it said

That great, far-sighted engineer, who probably did more good, and saved more lives, than any single Victorian public official.

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Of the great sewer that runs beneath, Londoners know, as a rule, nothing, though the Registrar-General could tell them that its existence has added twenty years to their chance of life".



Josie and her team...

THE  TIMES 16 March 2025

Those great, far-sighted engineers, who probably did more good, and saved more lives by working in partnership.

When they come, a thousand years hence, the health and achievements of the people will stand testimony to partnerships built at the start of the 21st century between local people, governments, NGOs, industry, engineering institutions and an international band of young engineers to testify that the MDGs were attainable and they were delivered.

As everyone knows, the infrastructure lifelines they delivered have added twenty years to everyone's chance of life...

In contrast, in 2025, it won't be a story about one man, but of many men and women - Josie and her Team – too many to name... Instead it needs to say this:

Those great, far-sighted engineers, who probably did more good, and saved more lives by working in partnership. When they come, a thousand years hence, the health and achievements of the people will stand testimony to partnerships built at the start of the 21st century between Local People, Governments, NGOs, Private Industry, Engineering Institutions and an International Band of Young Engineers to testify that the Millennium Development Goals were attainable and they were delivered. And, as everyone knows, the infrastructure lifelines they delivered have added twenty years to everyone's chance of life...

So where will we find these Young Engineers? Well, they are all around us!

The President's Apprentices 2009-10 An international band of young engineers...

Harnessing the energy of young engineers
to provide infrastructure for a better world

The President's Apprentice Scheme 2009-2010



And with my Presidential Apprentice scheme in my year as President, I have recruited the first 12 of this International Band of Young Engineers – to work with me to develop an engineer's toolkit to help us deliver this vision. It will be launched on October 19th and available on-line.

The President's Apprentices 2009-10

An international band of young engineers...



Abiodun Akinyemi



Nicola Bailey



Benjamin Bampoh



Lorna Brady



**Tonderai
Chakanyuka**



Fang Fang



Fazlun Fazlee



Hung Yik Lee



Joshua Macabuag



Joe Mulligan



Michelagh O'Neill



Tom Wilcock

A career in Civil Engineering??

The Apprentices: What motivates them? What inspired us? What motivated me?



It could have all been so different!!!

Mirfield in Yorkshire,
England

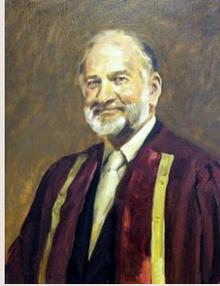
– The Calder and Hebble
Canal...

... engineering student
apprentice in 1969 with
Husband and Co



The Systems boys...

Ian Munro, Colin Brown, David Elms, David Blockley...
... and Paul Jowitt



Meeting at Churchill College Cambridge, ~1984

Ian Munro, Colin Brown and PWJ

... we walked to Kettles' Yard in the pouring rain...

*'a refuge of peace and order, of the visual arts and of music,
and the works of Henri Gaudier-Brzeska'*

Presidential Address 2009





Now is the time to support our young engineers

Now is the time...

- to unleash the skills of our young engineers

... the time to unleash their skills and enthusiasm

... the time for us to inspire them to inspire us

Now is the time to build engineering capacity worldwide for International Development and to deliver the UN Millennium Development Goals

Now is the time...

- to unleash the skills of our young engineers
- to deliver the UN Millennium Development Goals

... the time to build an infrastructure platform for a sustainable future

Now is the time for an engineering renaissance

Now is the time...

- to unleash the skills of our young engineers
- to deliver the UN Millennium Development Goals
- for an engineering renaissance

... the time to build and maintain the critical infrastructure upon which civilisation depends - both at home and abroad.

Now is the time...

- to unleash the skills of our young engineers
- to deliver the UN Millennium Development Goals
- for an engineering renaissance
- to build and maintain critical infrastructure

...The time to take a systems view of the world and deliver systems level solutions.

Now is the time...

- to unleash the skills of our young engineers
- to deliver the UN Millennium Development Goals
- for an engineering renaissance
- to build and maintain critical infrastructure
- to deliver systems level solutions

Providing the platform for a sustainable future for succeeding generations has never had a more important moral, economic, social and environmental imperative.

Now is the time to deliver

Now is the time...

- to unleash the skills of our young engineers
- to deliver the UN Millennium Development Goals
- for an engineering renaissance
- to build and maintain critical infrastructure
- to deliver systems level solutions

Now is the time to deliver

As civil engineers, this is our job

Now is the Time

Critical infrastructure
International development
Young engineers



Presidential Address 2009



Now is the time