



Delegates representing Great Britain and Northern Ireland at the 25th World Road Congress of the WRA, held in Seoul, South Korea

Contributions by international Technical Committees during the last four year cycle of the World Road Association featured at the WRA's 25th World Road Congress in Seoul in November 2015. Over the next 12 pages committee members share the very latest developments (see Flagship products) and subject matter (see Themes) in global highways best practice. Introduction by WRA UK Chairman Andrew Boyle.

It was a great honour to lead a very effective and enthusiastic team of delegates from the UK at the 25th World Road Congress of the World Road Association (WRA) in Seoul last November. The WRA has been in existence since 1908, has 122 member countries and is generally accepted as being the pre-eminent international body in highways. The UK has been a member since the very earliest days and has a high profile in the WRA having been actively supportive during that time.

The Congress provided an opportunity for UK delegates not only to get involved in many of the conference sessions as speakers and contributors but also to meet old friends and make new ones. The UK had a pavilion in the exhibition which provided a focal point for UK delegates to meet up, do business and provide information on how the UK does things.

My thanks go to CIHT for organising this, to the sponsors (Arup, Atkins, Keir/Mouchel and ReCAP) and to the Department for Transport which underwrote the whole thing. The involvement of DfT continues and I am very pleased to confirm that John Dowie (Acting Director of DfT's Roads, Traffic & Local Group) has agreed to take on the role of WRA UK President following an excellent spell by Graham Dalton (the last Chief Executive of the Highways Agency).

It was really good to have the support not only of the DfT but also the Department for International Development which has re-engaged with WRA UK after a period of 12 years. Throughout this time DfID had been working away in the low and middle income countries with HDM-4 and the rural access programme. It has a new programme of work in the transport field – I look forward to its increasing involvement in WRA in the UK.

Those who attended the Congress or have been involved in the Technical Committees (TCs) of the WRA during the past four year cycle have the opportunity now to explain what they have been doing and give their impressions of the Congress.

I trust that you will find something of interest which will whet your appetite for more. If so, please let us know by sending an email to wra-uk@ciht.org.uk

Beyond this we plan if there is enough interest to hold webinars with UK representatives to allow more detailed discussions.

What about the future? As our First Delegate says in his piece we have secured a number of important roles as both chairs and secretaries to the various TCs and Task Forces for the next cycle as well as populating the relevant committees with UK representatives.



WRA UK Chairman Andrew Boyle

I plan to see how we can make the work of the WRA more visible and relevant as we move into the next cycle. This may involve live webinars, interest groups to shadow and support the UK representatives on these committees and reports from them in future *Transportation Professionals*.

I would be pleased to receive your ideas and suggestions as we start to update our business plan, via our secretariat at CIHT. Finally, we are planning our next UK Congress which is likely to be held in Edinburgh in the first week of November. Please put the date in your diary.

First delegate takes stock of the last four year cycle

Transport Scotland shared knowledge at to the 2015 World Road Congress about the A9 average speed camera scheme

UK's First Delegate to the World Road Association, Transport Scotland's chief executive Roy Brannen, gives his personal take on four years of promoting and sharing UK expertise.

Work for the 2012-15 cycle of the World Road Association got under way in 2013 with the first meeting of the new Strategic Planning Commission (SPC). It was here that I stood as the UK representative, vice chair of the Commission working alongside Federal Highway Administration's Executive Director Jeff Paniati and lead for the commission's theme on safety.

The SPC oversees the work of the WRA and is the engine room that coordinates and overseas the knowledge generated.

My initiation was rather challenging – seven am on a Sunday and a delayed flight prompting urgent phones calls and relayed conversations: 'Don't shut the gates – he's on his way'. A flight connection made. Just.



Roy Brannen, the UK's First Delegate to the WRA

Over the next three years, though, it was interesting to help shape the workings of the Association.

I was delighted to see the UK contributing two very good products through the Special Projects initiative. The initiative helps provide high level guidance on issues identified as critical by senior decision makers from road authorities across the world. The first product was on the importance of road maintenance; the second, produced in the 2012-15 cycle and covered in this publication, was about the Climate Change Framework.

In 2013 I was pleased to note that international delegates from Technical Committee 1.1 'Performance of Transport Administrations' were being hosted by Transport for London. This garnered strong interest internationally on how TfL is structured and how it operates in terms of managing London's transport network. TfL also presented at one of the Strategic Direction Sessions at the World Road Congress in 2015.

The Winter Road Congress took place in Andorra in 2014, giving our winter service committee representatives the opportunity to hear from other countries. Worthy of particular note is the use of brine as a treatment for winter service, currently being evaluated by a number of UK highway authorities.

Also in 2014 the UK's Centre for the Protection of National Infrastructure led a symposium with specialists from across the world on issues of security of transport

systems. This event was hosted in London and a useful guidance document has been produced as a result.

Work on the UK national reports for the World Road Congress started in 2014. It was interesting to review the safety reports of other countries and see progress made in other areas.

At the 2015 World Congress it was gratifying to me that Transport Scotland was able to present on its A9 average speed camera scheme, alongside the session featuring TfL and another significant UK contribution on mobility and increased urbanisation.

At an international level the next Strategic Plan (2016-2019) follows on the work led by former UK First Delegate Jim Barton to produce sharper outputs and makes greater use of task force bodies to deliver work. We have sourced a good range of UK representatives for the next cycle, covering almost all areas of work.

They will build on the considerable achievements of UK experts working with their international counterparts from 2012-15. At a summary level these are reflected over the following pages. More can be found online at piarc.org

● One First Delegate is invited to represent each member country of WRA in recognition of their leadership of national highway and transportation industries. A network of over 100 First Delegates plays a significant role steering the direction of WRA's global roads community.

Unveiled: new resources for road safety and ITS practitioners

Work by WRA committee members over the past four years has resulted in release of useful new guidance on road safety and (see below) Intelligent Transport Systems.

A comprehensive new Road Safety Manual (RSM) was launched by the World Road Association at the World Road Congress in Seoul. The focus of the RSM is on guiding the management of the safe planning, design, operation and use of road networks in low, middle and high income countries.

The RSM provides information on the effective management of road safety infrastructure. Elected officials, political appointees, road safety practitioners, health professionals and transportation engineers, planners and leaders will all benefit from using the manual.



An online road safety manual has been produced



Advice on running a safe road network is contained in the new manual

There are three parts to the RSM. Part One sets the global perspective of road safety. Part Two provides guidance on road safety management. Part Three addresses the planning, design, operation and use of a safe road network.

Each chapter starts with a series of key messages, summarising the main points.

Advice is included for how newcomers to road safety can get started and how to make continued progress. There are also activities that higher performing agencies should aim for.

The RSM has been written to allow users to start at any part in the manual. Readers may review the key messages at the beginning of each chapter to get an overall understanding of content.

Further guidance is provided in the form

of illustrative examples, case studies and noteworthy practices. The case studies are from countries at all levels of development. However, there is a particular focus on lower and middle income countries.

Each chapter includes references to easily accessible documents or websites for further information. This manual is a significant contribution to supporting the aims of the UN Decade for Action on road safety.

For further information visit roadsafety.piarc.org/en

Authors: Roy Brannen, Transport Scotland and Strategic Theme Coordinator for Safety. Mike Griffith, US Federal Highway Administration and Chair of the Road Safety Manual task force

Big data a major draw for delegates to congress in Seoul

Launch of another of the World Road Association's flagship projects took place at the 2015 Congress: a website on Intelligent Transport Systems (ITS) and how it is used in road network operations (RNO). For details visit rno-its.piarc.org

This website has been under development with funding from the US Department of Transportation. A UK team was appointed to edit the site, working with an international group of 22 authors to develop its content.

The result is a comprehensive online resource of information and guidance available free of

charge for transportation professionals, policy makers, academics and students.

In the main session at the Congress on RNO there were presentations from the committee on how a user needs approach can be placed at the centre of everyday operations, the benefits of ITS to developing countries and the interesting possibilities for connected vehicles and cooperative systems.

One of the strategic sessions at Congress was devoted to the topical subject of 'big data' and its value as a source of intelligence on how road networks are used and as a basis

for short term forecasting of travel demand.

An impressive case study was provided by the Korea Expressway Corporation. Its Operations Analysis & Supportive Information System (OASIS) stores 70M items of data each day, amounting to a total of 20GB, providing valuable support for operations planning and management. We can expect to hear much more on this subject in the coming years.

Author: Dr John Miles, Co-editor of the RNO-ITS website and Honorary Member of the World Road Association



Software tool helps asset owners to prioritise funding

Well maintained networks should provide a range of benefits for all roads users – including cyclists

Asset management was a key theme at this year's World Road Congress, with participants at one session discussing the merits of software that helps professionals to make the right investment decisions.

When it comes to asset management one thing is certain. In order to make the right decisions about highway assets we need to have correct and reliable information that is easily accessible and presented in a meaningful way, in addition to the right skills and support to make things happen.

The highways sector is certainly maturing in its approach to asset management and this was evident through a series of presentations and workshops at the World Road Congress, with a focus on developments at both a strategic and tactical level.

I chaired a workshop titled: 'Road

Management and HDM-4' covering the strategic challenges faced by road agencies when making investment decisions. For those not in the know, HDM-4 is a very useful piece of software that helps professionals make investment decisions concerning road maintenance and improvement.

The workshop explored the views from different parts of the sector, from asset owners and consultants to government bodies and funding institutions.

Case studies on asset management were delivered from UK representatives alongside presentations from the World Bank, the UK Department for Transport and the World Road Association.

The main focus of the discussion was the

role of HDM-4 as a decision support tool. Examples were given on how this software could be used to build a business case for funding by demonstrating the long term impact of budgets on performance of a highway asset.

We also discussed how the UK Government is encouraging owners to embrace asset management and heard the views of both the WRA and the World Bank on future developments for HDM4.

The World Congress always provides an excellent opportunity to find out what is happening in the road sector around the world and gives a great insight on forthcoming challenges and developments.

Author: Lila Tachtsi, Director, Transport Asset Management, Atkins

Flagship products

Developing countries face similar challenges

When you think about developing countries and the issues they face you might conjure up images of rural roads and unpaved highways.

This is often the case but what people might not fully grasp is that the challenges – and opportunities – faced by those of low income countries can be similar to the UK and other high income countries.

So how do we support low carbon transport? How best to protect vulnerable road users? How can transport support rapid growth in urban areas? And how can countries compete globally and get goods to market via strategic trade corridors?

For the UK Department for International Development (DFID) these are four key areas currently being discussed.

And it is thought that developing countries could take advantage of new and emerging technologies and may even leapfrog more developed countries.

Asset management, planning and decision tools such as the HDM-IV (Highways Design and Management) suite need to respond to new challenges in the sector such as increasing numbers of road crashes, the impact of climate change, congestion and rapidly changing road transport technologies.

The World Road Association took the opportunity that the Seoul Congress presented to convene a meeting between key stakeholders that initiated a more detailed review of options for the further development of road asset management tools and the HDM suite.

With a focus on application of HDM in low income countries the study was supported by DFID with the results used to inform a workshop that set out the strategy and priorities for 'Future Asset Management Modelling' held at the World Bank in Washington in January 2016.

Author: Colin Gourley, UK Department for International Development

Flagship
products

Good advice shared on transport infrastructure security

Latest thinking on how best to protect transport systems from security threats was explored at the Congress

Measures put in place to help protect transport infrastructure from security threats were discussed at the World Road Congress.

Knowledge of security issues is vital for those working in the transport sector. There are a range of criminal and terrorist threats to be aware of, combined with risks of both state and commercial espionage and an increase in cyber attacks.

One good publication to know about

is the UK's 'TRANSEC Compliance Framework', which aims to protect the public, transport facilities and people employed in the transport industries against – primarily – acts of terrorism.

The framework has security objectives across several modes of transport and includes detail on the transportation of dangerous goods.

The current threat level from international terrorism for the UK is assessed as severe. International delegates at the World Road Congress learned about measures the UK had put in place to protect infrastructure.

Delegates were also interested to hear how the 'internet of things', 'open data'

and BIM – which all offer great benefits for society – should be approached with security in mind.

Two recent areas of guidance on these themes are of particular relevance for the UK transport network.

The first is 'PAS 1192-5:2015 Specification for security-minded building information modelling, digital built environments and smart asset management'. And the second is 'Open Data: Adopting a Security-Minded Approach'.

The guidance and supporting documents can be found on or via the website of the Centre for the Protection of National Infrastructure.

Security document seeks to protect infrastructure

Anticipating security threats to road infrastructure is vital for safeguarding public safety, the environment and the economic and social value of transportation. With the aim of promoting an appreciation of potential risks the WRA's Task Force on Security (TF2) published the high level guidance document 'Security of Road Infrastructure' last year.

The objective of the guidance paper is to



provide an overview of the range of security threats and issues that may affect road infrastructure, operations and users. The document is also intended to promote thought and discussion within the road community, raising awareness and encouraging highway authorities and operators to step forward with international good practice.

'Security of Road Infrastructure' outlines the following specific topics: assessment of physical security; different methodological approaches; safety and security programmes; application of knowledge in security by

design; and retrofitting protection to existing infrastructure.

Publication of the security paper followed a meeting of TF2 in the UK, including a visit to the Dartford Crossing which highlighted measures in place to protect infrastructure. Protection of bridges and tunnels is recognised as a key security consideration across many countries.

'Security of Road Infrastructure' outlines measures to protect such infrastructure with retrofitting of security solutions often providing a relatively cost effective way of doing so.

For detail visit piarc.org/en/publications/

Theme:
Management
and
performance

Taking forward road planning and delivery

Well performing transport organisations such as Transport for London tend to encourage collaborative working

WRA Technical Committee

1.1 covers the performance of transport administrations and has looked at changes to road authorities, to understand issues affecting institutional integrity.

Two different schools of thought were apparent at the table as TC1.1 came together to consider a simple starting question: Are multi modal transport authorities more effective and efficient than 'mode specific' agencies responsible for just roads, railways and other networks in isolation?

One view held that larger multi modal organisations sharing administrative and back office functions across multiple

departments must surely be more efficient. The other viewed separate mode specific authorities to be more effective and better focused on customers.

The main conclusion drawn, after a substantial study of examples of different transport governance arrangements worldwide, is that it does not really matter how organisations are structured. It is their cultural and behavioural attitudes and the abilities of individuals and leaders that count.

Multi modal transport agencies can be efficient and very effective, if teams are managed well and work together towards strategic goals. Significant efficiencies and other benefits of integration can also be achieved by separate organisations adopting joint working arrangements.

However, the successes of different organisational models are highly specific

to place and context; no single set of institutional arrangements is universally applicable or effective.

Three resources have been developed by TC1.1 for technical analysis of multi modal governance options: a conceptual model for multi modal transport; a toolkit of measures for multi modal collaboration; and advice on structural reorganisation (and associated appraisal of alternative governance models).

For the next WRA cycle the committee will take these studies further: returning to a number of differently structured transport authorities to see how they are progressing; examining non-structural aspects of leadership values and behaviours and review of the issue of how cultural change is managed.

Author: Jonathan Spear, Atkins

Working to improve financial performance on sustainable projects

Road authorities around the world must pay closer attention as to whether funds earmarked for sustainable road projects really do benefit the countries concerned.

This was one of the key recommendations to come from WRA Technical Committee 1.2 which looks to improve road authorities' performance in sustainable project financing.

According to the committee funds directed towards sustainable projects at present do not always get used for the purpose they were intended. TC1.2 examines current best practice and emerging trends in funding and private finance. It also investigates how key contractual aspects of road projects have changed in different countries over time.

Countries have had to adapt to a new

financial climate and the impact of this on traffic demand following the global financial crisis of 2008. But the committee has found that demand remains in many established and emerging economies for the appropriate use of private sector finance, with better procurement practices to complement public sector funding.

In recent years meetings were held by the committee at approximately six monthly intervals in Rome, Montreal, New Delhi, Santiago, Madrid and Tehran.

These meetings were hosted by our in country representatives and were well attended by other countries' committee members. Members also carried out project site visits and co hosted international seminars in Montreal, New Delhi and Santiago, allowing members

to compare notes with other leading industry professionals while sharing some of the findings of our research.

Our work over the past four years has culminated in a report incorporating the contributions of representatives from over 20 countries and summarising lessons learnt and best practice for the funding and financing of highway schemes.

As the UK's representative on TC1.2 I have thoroughly enjoyed networking with the other committee members and have developed a much better understanding of the challenges that road authorities around the world face in funding and delivering world class highway assets.

Author: Ian Paterson, Atkins

Theme:
Management
and
performance

Addressing a pressing issue

Working out how to reduce dependence on motor vehicles is a problem many countries are grappling with

Tough challenges of dealing with the impacts of climate change are being tackled through the adoption of more sustainable approaches across the global roads sector. Taking an overview of recent developments is the WRA Technical Committee 1.3 'Climate Change & Sustainability'.

Climate and carbon are now integral to almost every conversation in transport, from solar panelled roads to lorries drawing energy through pantographs reminiscent of the trolley bus era. But the word 'sustainability' is one that many hesitate to use; many feel the term is devalued by inappropriate use.

So for limiting climate change, are we nearer to the scale of emission reduction we need? The answer is not really, or at least not universally. The strong reliance on fossil fuelled transport systems remains a key barrier to the reduction of anthropogenic greenhouse gas emissions.

Is there hope? The reporting session of TC1.3 at the 2015 World Road Congress shared experience from across the world, from Germany to Nepal. Strong papers contributed to this session and showed how the twin challenges of climate adaptation and mitigation can be met through sustainable approaches.

For instance Nepalese bioengineering – using vegetation for ground stabilisation – is particularly useful on mountain roads at risk of landslides. Roots absorb surface and underground water, therefore reducing the saturation level of the soil. Perhaps bioengineering approaches

should be considered more in the UK following the floods in northern England.

So how can we up our game? For the roads sector climate change is fundamentally an issue of sustainability. It is in the adoption of more sustainable behaviours and expectations that success lies, albeit with the use of technology.

The urgency of the issue of climate change brings a positive energy, which we need to harness more effectively to resolve the wider question of sustainability.

Author: Simon Price, Ramboll and Dr Sarah Reeves, TRL

New global framework will aid adaptation to climate change

Climate change is expected to have a significant impact on global road infrastructure in future. For example hotter weather will lead to more incidences of heat damage to pavements and structures; more frequent occurrences of extreme rainfall will result in more flooding; and sea level rise may make some networks and assets inaccessible.

These impacts will lead to increased operational, maintenance and repair costs and cause disruption to the communities, services and businesses that rely on road infrastructure.

Effective and targeted action must be taken to increase global resilience to these impacts.

Existing road infrastructure policies and standards are typically based on historical climate data but attention now needs to shift to anticipating changing climates.

With this in mind, the World Road Association has developed a framework to guide road authorities through identifying which assets and operations are vulnerable to climate change. The framework will assist the prioritising of these risks, development of robust adaptation responses and integration of climate change risks into decision making processes.

Developed by AECOM through extensive research and consultation with road authorities globally the framework brings together evidence, insights and good practice available internationally into an effective and robust tool for use by any road authority, irrespective of geographical, economic, environmental or climatic condition.

The framework provides an iterative, life-



Lawrence Hargrave

Some roads are more vulnerable than others

cycle approach to climate change adaptation. It is designed to ensure any road authority (including those with limited resources) can take effective steps to increase their networks' resilience to climate change.

Author: Caroline Toplis, AECOM

Theme:
Management
and
performance

Transport appraisal requires careful consideration

Achieving maximum possible economic and social benefit are clear aims of many highway construction projects

Methodologies and tools used to appraise transport infrastructure projects were discussed by Technical Committee 1.4 at Congress.

Building confidence in data that supports decisions on highway projects is essential where resources are limited and the welfare of road users and the environment is at stake.

Throughout the world politicians and highway authorities seek reliable information to help them make road funding decisions that will produce the maximum possible economic and social value, with the least likely environmental impact.

WRA Technical Committee 1.4 set out to explore the methods used to build this necessary intelligence for appraising transportation schemes and to investigate the tools used to evaluate the positive and

negative impacts of projects after they have been completed.

The committee engaged policy makers, practitioners and universities around the world. One of the most salient outcomes from these discussions is an apparent lack of certainty over how local 'corridor level' benefits of a project are expressed as a means to help national economic performance.

At the corridor level, net benefits to road users tend to dominate project analysis. Extension to conurbations mostly consider the productivity of businesses.

However these conventions of analysis are divorced from conventional models of assessing national economic benefits.

Consequently an evaluation of the impact of road investment on wider economies presents a major challenge to transportation professionals.

The developing world has an added challenge in reaching the sustainable development goals of the United Nations. Transport investment in such countries are more intricately intertwined with health, education and other public sectors.

Fiscal constraints do not help the situation. The sustainable solution to the challenge of the developing world resides in engaging local universities which can provide the expertise for addressing the dynamic situation of transport.

Author: Fred Amonya, Lyciar, Chairman Technical Committee, Transport System Economics, PIARC

Huge scope for vehicle technology in developing countries

There are great opportunities and enormous potential for Intelligent Transport Systems to be used to benefit mobility in low and middle income countries and this was the subject of a discussion at Congress by Technical Committee 2.1

Technology is widely available and can be used cost effectively to improve the safety and operation of road networks.

Application of ITS can do a lot of different things, such as feed drivers with real time information and provide network operators with data for traffic and network management.

Communication between vehicles and infrastructure through 'cooperative systems' is now an emerging part of the ITS

industry, adding to technology already deployed widely, such as networks of control centres linked to arrays of variable message signs, cameras and sensors.

For low and middle income countries effective use of ITS does not have to require very large investment. Widespread technology in the form of wireless communication, mobile phones and in-vehicle connected devices such as sat nav systems, smartphones and computers provide readily available data.

What is frequently needed are advice and leadership and development of local expertise. There is general recognition of a shortage of skills and gaps in technical competence across the ITS sector worldwide.

In low income countries projects often

develop with input from ITS advisors from developed countries but local expertise is essential to ensure deployment and use of technology can be sustained.

To address this issue interaction with established ITS associations provides a positive platform for knowledge sharing, debate and learning. Such organisations are also good for promoting public-private partnerships, thus helping as a conduit for securing private sector investment.

Author: Lucy Wickham, Mouchel; Ian Patey, Mouchel Consulting and Richard Harris, Xerox

Theme:
Access and
Mobility



Winter service advances outlined

**Theme:
Access and
Mobility**

Effectiveness of brine treatments is being tested on three sites in Scotland as part of efforts to improve highway network resilience

Resilience of highway networks in winter to snow and flooding provided lively areas for discussion at the WRA's Technical Committee 2.4 which manages winter service.

Current trials testing the durability of brine treatments used to treat roads during winter is one of the key outcomes of recent work carried out by WRA's winter service committee.

Discussions from the 2014 Winter Road Congress in Andorra led UK members on the committee to instigate trials of the durability of brine treatments, run jointly by Transport Scotland, Highways England and their service providers.

One key objective of the trials is to compare salt loss, effectiveness and longevity between sodium chloride brine and pre-wetted salt. Initial trials have been completed and a second phase of prolonged live trials for the 2015/16 winter season is taking place this February across three sites in Scotland.

The WRA recognises the importance to the winter service community of changes in the approach to treatments and has made it a specific topic to be looked at for the association's next cycle (2016-2019).

Three reports published by the committee recently cover topics as diverse as crisis management, climate change and data collection. The crisis management report has a focus on winter service but the issues discussed may resonate with those trying to prevent large network disruptions.

The report on climate change and its effect on winter service summarises the thoughts of world leading researchers.

And the paper on data collection is one to keep an eye on for the future. The rapid development in vehicle based technology will soon be more readily harnessed by winter professionals.

Further papers presented at Congress included work from Sweden on a holistic winter service model and a presentation from the USA on how to focus research funding. The report looks to address the needs of the community and includes a 'Winter Maintenance Top 10', prompting lively discussion at Congress.

Authors: Alan Chambers, Amey; Stewart Leggett, Transport Scotland and Martin Hobbs, Highways England

Congress considers extreme weather events

Recognising the increasing impact of climate change on the resilience of national road infrastructures was the subject of a fascinating technical session.

This topic could not have been more timely following the recent climate change conference in Paris and ongoing havoc caused to highways in the UK after a succession of severe storms.

The session also included a look at the impact caused by other natural disasters such as earthquakes. Speakers from four continents identified a common theme about the need for resilience of their national road infrastructure.

Speakers from Europe including those from Norway, Sweden and myself representing the UK talked about the increasing need for resilience and adaption of road infrastructure. We talked about the severe damage to roads and bridges

caused by floods, landslides and coastal erosion.

The speaker from Norway identified identical challenges to those faced in the UK. Norway's research and development programme 'Climate & Transport' identifies that climate change impacts have to be considered as early as possible in the project planning phase.

It also says that adaptation measures should be carried out as part of planned maintenance work and repair. Collaboration helps with adaptation; from technical cooperation on the level of state agencies to the financial coordination between sectors.

Climate change is also having a severe impact to ground conditions in northern Canada. Here the milder conditions are causing permafrost to melt which causes severe settlement and cracking, damaging roads and runways.



Speakers from Chile, Japan and Indonesia talked about other natural disasters but also identified the need for national resilience.

These presentations identified similar challenges around the world. Use of an international network such as the WRA helps users share best practice experience in tackling the consequences of these events.

Author: Matthew Lugg OBE, Mouchel Consulting, part of the Kier Group

**Theme:
Safety**

International experience on road safety shared

Measures to reduce road traffic accidents are being considered by the World Road Association

Links between road safety investment and land use planning were explored in a session convened by the WRA Technical Committee which considers national road safety policies and programmes.

We do not have to wait for crashes to occur in order to make roads safer' was among the main conclusions at Congress of Technical Committee 3.1.

It was said that traditional methodological approaches to road safety, such as targeting accident blackspots, have been adopted by several countries around the world. However these days those approaches are either combined or replaced with more proactive methods, which are not necessary based on crash data.

Decisions on land use planning can have a significant impact on the overall

safety performance of the transportation system too, it was said.

Generally both land use and transportation decisions are made at all levels of government: national, regional and local. Coordination and agreement among those responsible for both is essential to support a safe and efficient transportation system.

Several tools and techniques to improve safety in transportation and land use interactions were explored at Congress, including better management of access, road safety audits and traffic calming.

Funding models were considered where

the primary objective of infrastructure investment is to improve road safety, such as Sweden's 'Vision Zero' initiative. The committee also looked at methods for maximising road safety benefits where infrastructure is being delivered but where improving safety is not the primary objective.

As well as looking at Sweden the Committee examined how road safety decisions are made in India, Malaysia, South Africa and Canada.

Authors: Matts Belin, Swedish Transport Administration and Alexandra Luck, A Luck Associates

Rolling out the Safe Systems more widely

Driver distraction and fatigue is a growing problem on the world's roads and is one of three areas which Technical Committee 3.2 is working hard to address.

Our group, which considers the design and operation of safer road infrastructure, is sure that improvements to road engineering through the so called 'Safe Systems' approach can help to make roads more forgiving for drivers and thereby safer.

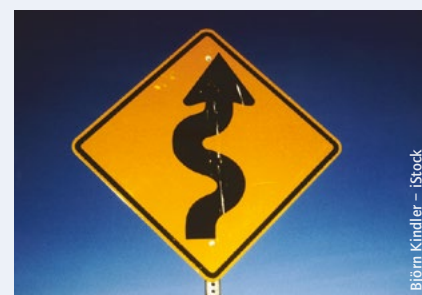
The Safe Systems approach says that mistakes made by a motorist should not always lead to a crash, but if a crash does occur it will not cause death or serious injury.

If we can engineer our road infrastructure so that, for instance, road users are segregated from one another or roads are designed so they make more sense to a road user the

outcome will hopefully be fewer casualties.

A second area of focus for our Committee over the last four year cycle has been to look at human factors associated with the quest for safer roads. An update to accident investigation guidelines from the World Road Association uses the Safe Systems approach, with the aim of better understanding the interface between road user and road. The guidelines identify any aspects of road design or features alongside a highway that could prove a 'trigger' for incidents to take place.

Our group is also looking at ways to improve safety for vulnerable road users, who account for half of all deaths on highways around the world. We are looking too at ways of addressing the fact that a disproportionate number of deaths and serious injuries among vulnerable users are



Hazardous roads need to be better designed

in low and middle income countries.

Our Committee works to assist countries, especially developing nations, with safer engineering approaches to road design and operation. The strengthened engagement with these countries must be a strong focus of the World Road Association going forward.

Author: Mike Greenhalgh, Amey


 Theme:
Safety

Best practice provided for highway structures

Safety of road tunnel users around the world is a key focus for technical committee 3.3

Safety and smooth running of highway structures are among the responsibilities of two WRA Technical Committees: TC3.3 which looks after Road Tunnel Operations and TC4.3 which manages Road Bridges.

Providing advanced safety systems that consider fully the needs of mobility impaired drivers using highway tunnels is a key area of focus over the next three years for the technical committee on Road Tunnel Operations.

TC3.3 will investigate what issues need addressing for the benefit of disabled people and write a report focusing on best practice before 2019.

Further priorities for the committee include a look at how best to design laybys and LED lighting in road tunnels. The committee will then look to update further the online Road Tunnel Manual to reflect developments in best practice.

Looking forward the technical committee will also continue to identify challenges associated with and provide best practice guidance for the design and operation of road tunnels around the world.

During the previous three years six new working groups were set up by the committee to report on specific areas of work. As a result eight technical reports and four papers have been prepared. Presentations and discussions at the recent World Road Congress covered much of the recent work.

Ensuring safety within tunnels remains the fundamental goal of the committee. TC3.3 also plans to continue working

towards identifying and encouraging best practice in tunnel operations, including ventilation, machinery and lighting.

The committee will continue to share its knowledge around the world through the updated Road Tunnel Manual and online training courses.

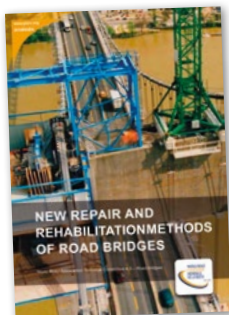
TC3.3 on Road Tunnel Operations was formed in 1957 to focus on activities including those relating to internal design, safety of users, equipment and the operation of road tunnels.

Authors: Fathi Tarada, Mosen; Gary Clark, Atkins and Les Fielding, London Bridge Associates

Innovation encouraged by new road bridge rehabilitation guidance

Japanese engineers' use of dustless blasting to remove paint cleanly from steel bridges is detailed in a new report produced by WRA's Road Bridges Technical Committee. The innovation involves a vacuum blasting technique that also withdraws old bridge coverings at the same time. This helps to significantly reduce the risk of abrasives, fumes and toxic paint fragments from escaping into the air.

TC4.3's report is titled 'New repair and rehabilitation methods for road bridges' and is currently available to download from the piarc website. Another new technique covered by the report involves dealing with bridge decks which have been penetrated by de-icing salts and are beginning to corrode.



A solution developed in Belgium involves managing the long term risk of tendon corrosion by injecting a corrosion inhibitor solution

into the tendon using an ultrasonic pump. A cement grout can also be injected if large voids are detected during this process.

The report also says that the average age of road bridges is over 50 years and a large number are in poor condition. Economic constraints led to the search for innovative solutions to extend the service life of the bridges and rehabilitate them in a cost effective way.

From an international survey 22 cases of

degradation were selected that mainly affect reinforced concrete and prestressed concrete bridges. For each of these, operators were invited to describe the standard repair method as well as innovative methods that have been applied.

A comparison between the methods is made in the report, considering reliability, availability, maintainability and safety. The financial aspect and environmental sustainability are also examined.

Three further reports recently produced by the Road Bridges technical committee cover 'Adaptation to climate change', 'Risk-based management of bridge stock' and 'Estimation of load carrying capacity of bridges based on damage and deficiency'. These three reports will be available to download from the website soon.

Author: David Ashurst, Arup


 Theme: Infrastructure

Funding for roads helps to propel economies forward

Well performing roads can help countries around the world to prosper and improve their economic situation

Asset management is a crucial component in ensuring roads deliver their service requirements and is the focus of Technical Committee 4.1.

Roads are the foundation for economic activity right across the world and their upkeep can directly contribute up to a fifth of a country's wealth, delegates to Congress heard.

It was also said in Seoul that highways are often a country's largest single publically owned asset. Stable and sustainable levels of funding must be available for the upkeep of roads everywhere but in particular in developing countries and those going through a period of transition.

In addition Congress heard that information and data on the condition of highway assets must be held in a form that can be understood by decision makers.

Similarly communications between those who make decisions about highways and road users must be clear and direct to ensure that investment is spent wisely.

Four working groups belonging to Technical Committee 4.1 have spent the last three years speaking to asset management specialists in over 30 countries and coming up with a series of reports which they presented to Congress.

One report is titled 'Assessment of Budgetary Needs and Optimisation of Maintenance Strategies for Multiple Assets'.

It says that most road authorities have a long term strategic plan but also face constraints with budgets. Minimum targets

and requirements should be set for safety, comfort and structural issues of a highway asset. Illustrating the public benefit of roads investment can also help politicians to make decisions, it adds.

A second report titled 'Balancing of Environmental and Engineering Aspects in the Management of Road Assets' describes how environmental criteria are important as part of the decision making for asset management.

Delegates were also told about the 'Roads Asset Management Manual', which will shortly be available as a web based tool to all WRA members.

Further development and promotion of the asset management manual will be a key objective for the Committee going forwards.

Authors: Alan Taggart, KPMG UK and Sam Beamish, Kier

Earthworks discussions benefit UK engineers

Technical Committee 4.4 brings together global specialists in earthworks and unpaved roads. Earthworks are a very important aspect of infrastructure, especially for roads and bridges in the UK.

This is because UK soils are predominantly clay based. 'Clayey' soils are problematic to engineering structures due to their low bearing capacities and susceptibility to volume change under conditions of varying moisture.

My role on the committee is to keep track of research in this area from around the world from which the UK may benefit. Most of this information is obtained through thorough study of the minutes of Congress meetings, in which members discuss and report studies and ongoing research projects.

An example of such studies include progress being made in South East Asia of road

construction projects under extreme weather conditions.

Another example of such studies is the comparison of the specifications of various systems for creating earthworks that is expected to be published soon.

Studies and research of interest are forwarded to the WRA (UK) chairman for further consideration of the UK road sector stakeholders.

The sharing of knowledge and technology transfer assists in quick adaptation of useful techniques and reduced research costs for the UK. Steps are being taken in the right direction in harnessing best practice from all over the world and applying these for the benefit of engineers in this country.

Author: Andrew Otto, TRL