



WORLD ROAD ASSOCIATION ACTIVITY REPORT 2012 - 2015

FROM THE MEXICO CONGRESS (SEPTEMBER 2011)
TO THE SEOUL CONGRESS (NOVEMBER 2015)



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PRESIDENT'S FOREWORD

This Activity Report 2012-2015 presents a thorough review of the World Road Association's tasks and accomplishments of the four-year work cycle that will end in December 2015, just after the XXV World Road Congress that will take place in Seoul, Republic of Korea, on November 2-6, 2015 under the theme "Creating New Values from Transport".

Highlights include the very successful XIV International Winter Road Congress that was held in Andorra in early 2014 and its related exhibition, which was the largest event ever held in that country, and the work undertaken by the 18 Technical Committees to implement the Strategic Plan 2012-2015 under the leadership of their Chairs, Secretaries and the four Strategic Theme Coordinators.

This work will be source of the Technical Sessions at the Seoul Congress, of 54 reports issued during this cycle to be disseminated after the Congress and 31 seminars organized in developing countries and countries in transition. These outputs are made available via a revamped and redesigned web site that is now one of the most important resources available to members, and the 16 high-quality issues of Routes/Roads that have been produced and distributed regularly during the four- year cycle.

All such activities, and many others whose account you will find in this Activity Report, constitute the core of the work of the Association and as such allow it to remain at the forefront of information and knowledge exchange on roads and road transportation worldwide. They were undertaken with the active participation and total commitment of talented individuals in many countries and regions of the world. Most of them were generously supported by their respective organizations, and this, once again, demonstrated the vitality of our Association and its network of high quality professionals. In the name of the Association and its membership, let me express to all, individuals and organizations alike, our recognition and deepest gratitude.

An Association such as ours always faces new challenges and opportunities. Both of them need to be met and developed in ways that allow it to remain active, relevant, and recognized as an unparalleled source of knowledge and information for road professionals all over the world. Thus, during the period 2012-2015 many activities took place to think forward and develop new initiatives to make our Association more effective in the fulfilment of its mission.

A major outcome of the Association in this period is beyond doubt the launching of fully redesigned electronic manuals, regularly updated and easy to print. They offer an invaluable database and knowledge sharing platform for road stakeholders, experts, academics, engineers, and a wider public, to be used in one's office as well as on the spot. The first set, reflecting the efforts of the relevant technical committees, as well as highlighting fruitful partnerships with fellow organizations, comprises three manuals on road tunnels, road safety and road network operation (RNO/ITS) respectively. They pave the way to a new generation of tools provided by the Association to the road community.

The special reports published during this cycle, "The Importance of Road Maintenance" and "The International Climate Change Adaptation Framework for Road Infrastructure", also provide clear evidence of the value that can be generated in a short time span by ad hoc groups from within the Association.

The Strategic Plan 2016-2019 itself constitutes an outstanding product of our Association over the elapsed period. Based on both traditional and new strategic themes, and proposing innovative ways to develop our work and enhance the Association's outreach, it has given special attention to include topics and outcomes that offer more value to developing countries and countries with economies in transition. Special consultations were made to identify those topics and reflect them in the Plan in ways that are both achievable and meaningful.

As the new UN Sustainable Development Goals show, roads and road transportation have much to offer to promote development and higher standards of living worldwide, and our Association can make substantial contributions to make knowledge and information available to professionals in countries where they are badly needed.

The initiatives reflected in the Plan have been undertaken with the active participation of the Commissions on Strategic Planning, Communications and Finance, and with the strong commitment and excellent work of the Secretary General and his staff at the Secretariat. The strong financial position of our Association, the solution of its more pressing accommodation concerns and the always solid support provided by the Executive Committee and the Council have been instrumental in giving it more room to concentrate on activities that will allow it to better fulfil its mission.

With the closure of the present working cycle, the tenure of Jean-François Corté as Secretary General of the World Road Association will also come to an end after 14 years. The process to identify and nominate our next Secretary General is already underway with the full support of the Government of France, whom I gratefully thank, and will hopefully culminate at the Council meeting in Seoul with the designation of the new Secretary General.

In the name of the World Road Association and all its members, I wish to thank Jean-François Corté for so many years of full commitment and high-quality work for our Association. Jean-François Corté leaves a legacy of dedication and professional standards that will always inspire and encourage us to continue his quest for excellence in the Association's work. We wish him the greatest success and the best of luck in the next activities that he decides to pursue.

During the final months of 2015, four major events that will be important for roads and road transportation worldwide are scheduled to take place. The post-2015 development agenda to be adopted by the United Nations in September in New York, the XXV World Road Congress in Seoul and the Ministerial declaration on Road Safety in Brasilia, both in November, and the COP 21 Convention on Climate Change that will take place in Paris in December will address topics that will shape the agenda of roads for years to come.

We at the World Road Association will follow up these events closely and make sure that they are reflected in our future work. These inputs will come in timely as 2016 will mark the launch of a new work cycle for our Association. We must ensure that the new Secretary General gets off to a strong start and that a rapid dissemination of the results of the XXV World Congress in Seoul is completed. I look

forward to your support to ensure that our Association successfully meets these challenges and that it continually improves to provide valued services to its members.



Oscar de Buen
President of the World Road Association (PIARC)

1. GOALS AND ACTIVITIES CONSISTENT WITH NEEDS

1.1. History and role of the Association

Founded in 1909 following the first International Road Congress held in 1908 in Paris, PIARC (Permanent International Association of Road Congresses) is the oldest international association in the road sector. It was renamed **World Road Association** in 1995. The World Road Association is a non-profit, non-political association. Its goal is to develop international cooperation and foster progress in the area of roads and road transport.

Founded by 15 countries, the World Road Association has 122 government members, as at January 1st, 2015, as well as other members (regional authorities, collective members and individual members) from 140 countries approximately.

Since 2012, **four new governments were admitted as members of the Association: Bahrein and Malta in 2012, Myanmar and the United Arab Emirates in 2014.**

The World Road Association's 122 National Member Governments (January 2015)

ALGERIA	CROATIA	LATVIA	RUSSIA
ANDORRA	CUBA	LITHUANIA	SALVADOR
ANGOLA	CYPRUS	LUXEMBOURG	SAUDI ARABIA
ARGENTINA	CZECH Rep.	MADAGASCAR	SENEGAL
AUSTRALIA	DENMARK	MALAYSIA	SINGAPORE
AUSTRIA	DOMINICAN Rep.	MALI	SLOVAK REPUBLIC
AZERBAIJAN	ECUADOR	MALTA	SLOVENIA
BAHREIN	EGYPT	MAURITANIA	SOUTH AFRICA
BANGLADESH	ESTONIA	MAURITIUS	SPAIN
BELGIUM	FINLAND	MEXICO	SRI LANKA
BENIN	FRANCE	MOLDAVIA	SWAZILAND
BHUTAN	GABON	MONACO	SWEDEN
BOLIVIA	GERMANY	MONGOLIA	SWITZERLAND
BRAZIL	GHANA	MOROCCO	SYRIA
BULGARIA	GREECE	MYANMAR	TANZANIA
BURKINA FASO	GUATEMALA	NAMIBIA	THAILAND
BURUNDI	GUINEA	NEPAL	TOGO
CAMBODIA	HONDURAS	THE NETHERLANDS	TONGA
CAMEROON	HUNGARY	NEW ZEALAND	TUNISIA
CANADA	ICELAND	NICARAGUA	TURKEY
CANADA-QUEBEC	INDIA	NIGER	UGANDA
CAPE VERDE	INDONESIA	NORWAY	UKRAINE
CHAD	IRAN	PAKISTAN	UNITED ARAB EMIRATES
CHILE	IRELAND	PANAMA	UNITED KINGDOM
CHINA (PEOP. REP.)	ISRAEL	PAPUA NEW GUINEA	UNITED STATES
COLOMBIA	ITALY	PARAGUAY	URUGUAY
CONGO (REP.)	JAPAN	PERU	UZBEKISTAN
CONGO (DEM REP)	KENYA	PHILIPPINES	VENEZUELA
COSTA RICA	KOREA (Rep.)	POLAND	VIET NAM
IVORY COAST	KUWAIT	PORTUGAL	YEMEN
		ROMANIA	ZIMBABWE

Since 1995, the World Road Association (PIARC) activities—funded by the fees from its membership — have been driven by strategic plans that are developed for a four-year period.

The Association covers a wide spectrum of road and road transport issues, i.e. economics; environment; road safety; road infrastructure financing; construction; road infrastructure maintenance and management; recent developments in the organization and mission of road administrations; all of them being key concerns for public authorities and road and road transport practitioners.

The World Road Congresses -- the World Road Association's initial reason for being—as well as the International Winter Road Congresses are organised every four years. Both events provide opportunities to review the state of the art and practices and have forward-looking discussions to give direction to our action in the years to come.

For over sixty years, the World Road Association's work has been supported by Technical Committees that represent the areas of study and discussion forums and bring together experts from the member countries.

1.2. Strategic Plan 2012-2015

1.2.1. The World road Association's Mission, Values and Vision

The World Road Association's purpose, mission, values and vision, as identified in 1995, are still considered to be relevant.

The World Road Association exists to serve all its members by:

- being a leading international forum for analysis and discussion of the full spectrum of transport issues relating to roads and road transport,
- identifying, developing and disseminating best practices and facilitating improved access to international information,
- fully considering within its activities the needs of developing countries and countries in transition,
- developing and promoting efficient tools for decision making on matters related to roads and road transport,
- providing advice on directions to the world's transportation system.

The World Road Association's values are:

- to provide universal quality service to its members,
- to be open, objective and impartial,
- to promote the development of sustainable solutions,
- to recognise road transport in an integrated transport and land use context,
- to be customer driven,
- to respect the differing international road transport needs.

1.2.2. Strategic Objectives

Just like the four previous four-year plans, the 2012-2015 Strategic Plan was developed out of a survey of the First Delegates of the member governments, a consultation of the outgoing Technical Committees and the National Committees, and the conclusions of the previous Congress held in Paris in 2007. The Strategic Plan organizes the activities of 17 Technical Committees and 2 Task Forces in four Strategic Themes:

- Strategic Theme 1 - Management and Performance,
- Strategic Theme 2 - Access and Mobility,
- Strategic Theme 3 - Safety,
- Strategic Theme 4 - Infrastructure.

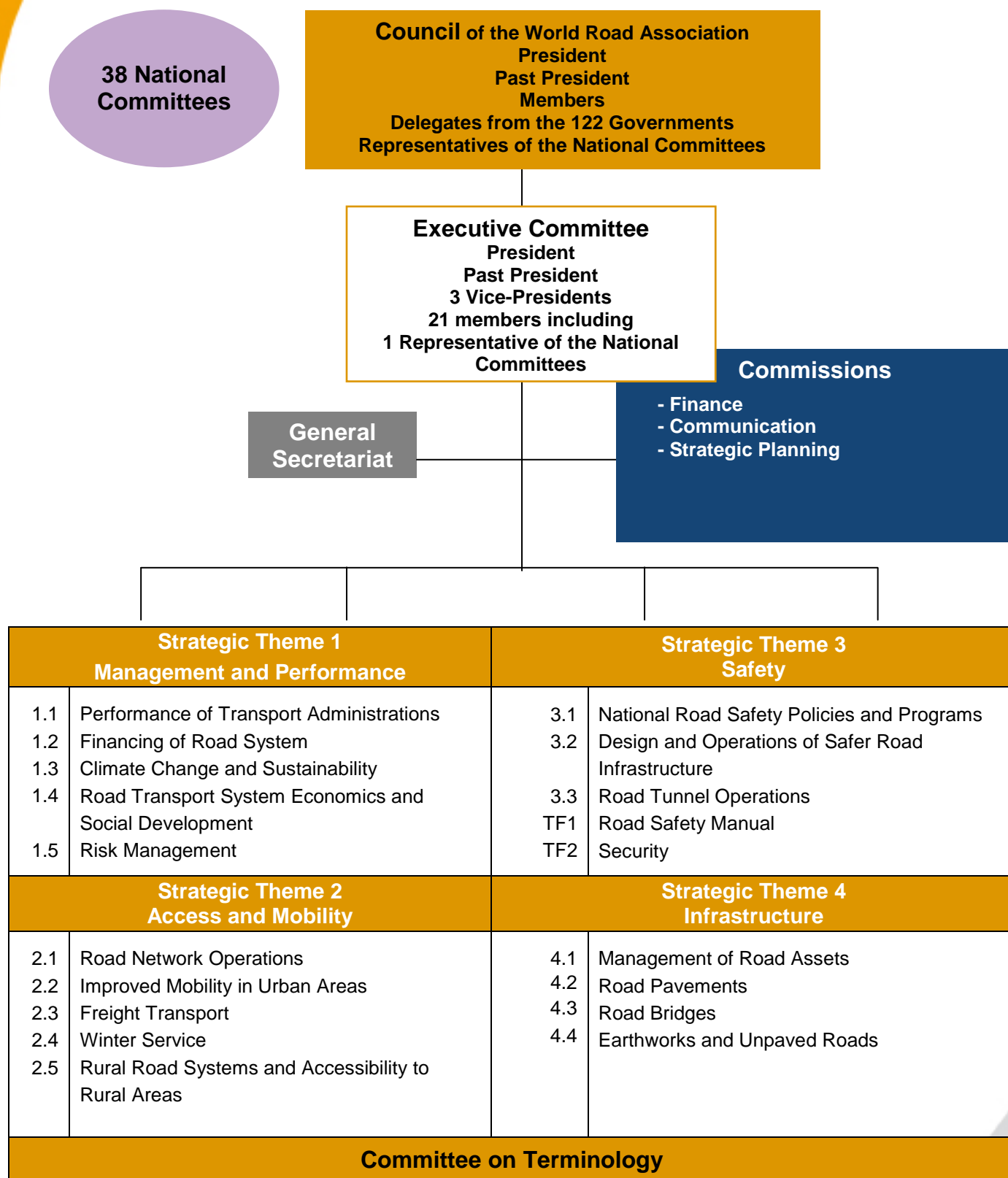
Besides the 17 Technical Committees and 2 Task Forces, mention needs to be made of the Committee on Terminology whose activity runs across all themes.

In addition to the issues assigned to the Technical Committees and Task Forces, the 2012-2015 Strategic Plan has also defined a series of organisational goals to help the World Road Association fulfil its mission. These goals, listed below, have been translated into strategies for action:

1. **Goal 1:** To continuously improve the management and operation of The World Road Association in order to provide members with a service that represents good value for money.
2. **Goal 2:** To promote cooperation, including knowledge sharing and exchange and joint projects, with regional organisations of road authorities and with other international organisations with related goals.
3. **Goal 3:** To host major Congresses that are valuable events for setting direction for the future, provide knowledge exchange and networking opportunities among members of the road transport community, and develop a range of options that are viable from the World Road Association's point of view.
4. **Goal 4:** To build and strengthen the activity and visibility of the Association at the national level.
5. **Goal 5:** To develop directions designed to freely facilitate practical means for efficient and effective knowledge transfer among countries.
6. **Goal 6:** To improve participation of member governments, and to increase the number of members of the road community benefiting, whether through National Committees or by direct participation, in the World Road Association Technical Committees.
7. **Goal 7:** To develop practical means for efficient and effective knowledge transfer among countries and to produce and disseminate authoritative, impartial and interesting publications and products that address current road and road transport issues.
8. **Goal 8:** To put in-place transparent and rigorous financial management of the Association and in the service of its purpose, and to optimise its resources in order to meet future challenges.
9. **Goal 9:** To identify, develop and promulgate policy and practices that contribute to safer and more effective management and use of road and road transport systems within an integrated sustainable transport context.

2. STRUCTURE OF THE ASSOCIATION

The following diagram outlines the way the Association operates for the period 2012–2015.



2.1. The World Road Association's Council

The Association is governed by the Council, which is made up of delegations from member governments, each led by a First Delegate, and representatives from the National Committees. The Council meets once a year. During the period 2012-2015, the most important decisions made by the Council were as follows:

Lucerne, 24-25 October 2012

- Oscar De Buen (Mexico) was elected President of the World Road Association for the period running from 1st January 2013 to 31 December 2016. He took over this post from Anne-Marie Leclerc (Canada-Quebec).
- The members of the Executive Committee and the Vice-Presidents: Menno Henneveld (Australia), Tchona Idossou (Burkina Faso), Friedrich Zotter (Austria) were elected for the period 2012-2016.
- The term of the Secretary General, Jean-François Corté, was extended until 2016.
- The Council accepted the membership requests from the Kingdom of Bahrein and the Republic of Malta.
- The 2012-2015 Strategic Plan was definitively approved.
- Colin Jordan (Australia) was elected Honorary President of the Association.

Rome, 6-7 November 2013

- The Council selected Gdańsk (Poland) to host the XVth International Winter Road Congress.
- Keiichi Inoue (Japan) was elected Honorary Vice-President of the Association; Raymond Landry (Canada-Québec), John Miles (United Kingdom), Têlé David Olodo (Benin), Claude Van Rooten (Belgium), Hans-Joachim Vollpracht (Germany) and Robert Wilson (Australia) were elected Honorary Members of the Association.

Santiago de Chile, 29-30 October 2014

- The Council accepted the membership requests from Myanmar and the United Arab Emirates.
- The Council approved the draft structure of the Strategic Themes and Working Groups for the cycle 2016-2019.
- The Council selected the application from Abu Dhabi (United Arab Emirates) to organize the XXVIth World Road Congress in 2019.
- The Council confirmed that the Association's Head Office should be located in La Défense, in the premises provided free of charge by the French ministry of Transport.
- Francisco Criado Ballesteros (Spain), Gheorghe Lucaci (Romania) and Daniël Verfaillie (Belgium) were elected Honorary Members of the Association.

2.2. Executive Committee

The Executive Committee meets twice a year and is in charge of implementing the policy decided by the Council. As of January 1st 2013, the Executive Committee Members have been as follows:

President	Oscar DE BUEN	Mexico	
Past President	Anne-Marie LECLERC	Canada-Québec	
Honorary Presidents	Enrique BALAGUER	Spain	
	Colin JORDAN	Australia	
	Victor MAHBUB	Mexico	
	Olivier MICHAUD	Switzerland	
	Hiroshi MITANI	Japan	
Vice-Presidents	Menno HENNEVELD	Australia	
	Tchona IDOSSOU	Burkina Faso	
	Friedrich ZOTTER	Austria	
	Valentin ANTON	Rumania	
Members	Fausto BARAJAS CUMMINGS	Mexico (until October 2014)	
	Raúl MURRIETA CUMMINGS	Mexico (as of October 2014)	
	Roy BRANNEN	United Kingdom	
	Ping CHENG	P.R. China	
	Cheick Oumar DIALLO	Mali	
	Rudolf DIETERLE	Switzerland	
	Terje Moe GUSTAVSEN	Norway/NVF	
	Joseph Odo HAULE	Tanzania	
	Abdul Karim bin JUDIN	Malaysia	
	Shigeru KIKUKAWA	Japan	
	Nak-Joo KIM	Korea (until April 2015)	
	Stefan KRAUSE	Germany (as of October 2014)	
	Josef KUNZ	Germany (until October 2014)	
	Lungile MADLALA	South Africa	
	José Miguel ORTEGA	Chile	
	Jeffrey PANIATI	United States	
	María del Carmen PICÓN	Spain	
	Christophe SAINTILLAN	France	
	Miguel Ángel SALVIA	Argentina	
	Massimo SCHINTU	Italy	
	Skirmantas SKRINSKAS	Lithuania/BRA (until April 2015)	
	Milton TORRES	Ecuador	
	Jane WELDON	Canada	
	Representative of the National Committees	Bojan LEBEN	Slovenia
	Secretary General	Jean-François CORTÉ	France

The Executive Committee held the following meetings:

2012 – Reykjavík (Iceland), 12-13 April; Lucerne (Switzerland), 22-23 October

2013 – Washington, D.C. (United States), 13-14 February; Rome (Italy), 5-6 November

2014 – Andorra (Principality of Andorra), 5 February; Santiago (Chile), 28-29 October

2015 – Riga (Latvia), 14-15 April; Seoul (Korea), 29 October.

The important subjects covered in the Executive Committee meetings include:

Implementation of the 2012-2015 Strategic Plan

- creating the Technical Committees and Task Forces for 2012-2015: finalizing the terms of reference, appointing the Chairs and the English, French and Spanish speaking secretaries;
- appointing the Chairs and members of the 3 Commissions and approving their action plans and work programmes for the period 2012-2015;
- orienting and overseeing the activities of the Themes and Technical Committees.

Congresses

- Approval of the programme of the XXVth World Road Congress to be held in Seoul in 2015: Ministers' Session, the topics for the Special Sessions and the Strategic Direction Sessions, and for the call for individual papers;
- The terms of reference for the call for applications for organizing the XVth international Winter Road Congress in 2018;
- Validation of the requirements and issuing the call for applications for organizing the XXVIth World Road Congress in 2019;
- Examination of the Memorandum of understanding with Poland and the United Arab Emirates for organizing respectively the XVth international Winter Road Congress in 2018 and the XXVIth World Road Congress in 2019 with a view to its validation by the Council and signing in Seoul.

Preparation of the 2016-2019 Strategic Plan

- Preparation of the Strategic Plan 2016-2019 for validation by the Council in Seoul; in particular introduction of a 5th Strategic Theme; and extending the principle of working groups to regions or specific topics.

Communication

- New design and creation of web based communication tools, i.e. introduction of e-Routes/Roads; newsletter of the Association; National Committees bulletin; participation in the social networks;
- Promoting the Association through its "flagship products";
- Developing a language policy to encourage a wider use of Spanish within the Association.

2.3. Commissions

Three Commissions assist the Executive Committee in its tasks:

1. Finance Commission,
2. Communication Commission
3. Strategic Planning Commission,

2.3.1. The Finance Commission

The Commission, which is chaired by Mr Rudolf Dieterle (Switzerland) is jointly responsible, with the General Secretariat, and subject to the approval of the Executive Committee, for managing all aspects/items related to the use of the Association's funds. During this period, in accordance with Goal 8 of the Strategic Plan, which is to achieve transparent and rigorous financial management of the Association, the Commission has focused on, in particular:

- the previous year's accounts (approval of accounts that have been closed);
- implementation of the budget for the current year;
- the draft budget for the following year;
- financial considerations relating to the Andorra Winter Road Congresses and to the Seoul World Road Congress;
- the various options for the premises of the Association's Head Office;
- the financial policy of the Association.

A very healthy financial situation

Based on a continued financial policy adopted by the Council in 2005, the 2012-2015 period was marked by the consolidation of the Association's own funds due to Congress revenues, to continuing prudence over expenditure and to a low level of increase in membership fees.

Annual membership fees for the 2012-2015 period

Government membership fees (in euros):

Membership category	Membership fees (in euros)	
	2009-2013	2014-2015
A	19,350	20,050
B	11,800	12,500
C	7,300	7,600
D	4,700	4,900
E	2,750	2,850

Individual and collective members fees

	Membership fees (euros)	
	2008-2013	2014-2015
Collective members		
High income countries	455	470
Other countries	280	290
Individual members		
High income countries	56	58
Other countries	28	29

2.3.2. Communication Commission

The Communication Commission, chaired by Jane Weldon (Canada), held its first meeting on 10 and 11 June 2013 in Paris (France). The meeting decided on the Commission's work programme with reference to the general goals that have been assigned to it, namely:

- increase awareness and recognition of the Association as an international forum for the exchange of information and knowledge;
- widely disseminate the output of the Technical Committees;
- increase membership.

In addition, the Commission has defined the rules of the World Road Association Prizes Competition. The Prizes will be awarded to the best individual papers selected for the XXVth World Road Congress in Seoul in 2015.

THE WORLD ROAD ASSOCIATION Prizes Competition 2015

This competition, which aims to heighten the profile of the road sector and promote the World Road Association's activities, elicited a large number of entries.

After a preliminary selection by member countries, 30 essays from 23 countries were sent to the international jury, which was chaired by Jane Weldon (Canada) and made up of Jean-François Corté (World Road Association General Secretariat), and a representative of each country that is sponsoring one of the prizes: David Palmitjavila (Andorra), Neil Scales (Australia/New Zealand), Claude van Rooten (Belgium), Danielle Fleury (Canada-Québec), Dr. Hirofumi Ohnishi (Japan), Luis Rojas Nieto (Mexico), Andrew Boyle (United Kingdom).

These essays were competing for one of the following eight prizes: Road Construction and design; Road Maintenance and Operation; Road Safety; Sustainable Development; Intermodality; Young Professionals; Developing Countries, and the Maurice Milne medal for the most innovative idea.

The results of the competition will be announced at the opening session of the Seoul Congress.

New communication tools and new products

In order to raise the Association's profile, and to increase participation in its activities and the number of members, the Commission has worked out a communication plan which aims both to enhance the Association's products and to develop new tools.

The "flagship products", including electronic manuals and Special Projects, are accompanied by a communication plan and are publicized at the major events that the Association organizes or takes part to. Particular attention has been given to the message developed and intended for the main target audience, i.e. top level decision makers.

The communication tools which are now familiar to the various audiences, i.e. Routes/Roads magazine, website, newsletter, National Committees bulletin, have regularly been improved, both in terms of design and content, and in terms of user friendliness. Lastly, the Association has initiated a policy to develop its presence on the social networks, by posting information on LinkedIn on a regular basis. This will be pursued and widened in the future.

2.3.3. Strategic Planning Commission

The Strategic Planning Commission, chaired by Jeffrey Paniati, met for the first time on February 12, 2013, in Washington D.C. (United States). During that meeting, the work programme was refined. The Commission is responsible for:

- overseeing the implementation of the current Strategic Plan,
- deciding on the technical programme for the 2015 World Congress in Seoul,
- preparing the 2016-2019 Strategic Plan.

The Strategic Planning Commission includes the Strategic Theme Coordinators, who have the task of advising the Technical Committees that relate to their theme and ensuring the work is conducted in accordance with the goals set out in the Strategic Plan.

For the period 2012-2015, the Strategic Theme coordinators have been as follows:

Strategic Theme 1 Management and Performance	Friedrich ZOTTER	Austria
Strategic Theme 2 Access and Mobility	Hirofumi OHNISHI	Japan
Strategic Theme 3 Safety	Jeffrey PANIATI then Roy BRANNEN	USA United Kingdom
Strategic Theme 4 Infrastructure	Carlo MARIOTTA then Vicente VILANOVA then Óscar GÚTIÉRREZ BOLIVAR	Switzerland Spain Spain

In addition, the Strategic Planning Commission has overseen two Special Projects during this period:

- Special Project on the Importance of Road Maintenance;
- Special Project on Defining an International Climate Change Adaptation Framework,

and the development of the Road Safety Manual.

A Strategic Plan for 2016-2019 that meets the new aspirations of the member countries

Preparation of the draft 2016-2019 Strategic Plan has involved an iterative process of debate and consultation. This has enabled to reflect the concerns of member countries in the terms of reference of the new Technical Committees, i.e. road safety; responsibility with regard to climate change; sustainable approach to mobility; risk management; and intermodal approach to transport needs. The Executive Committee will submit the draft to the Council for approval in Seoul.

For the 2016-2019 cycle, in addition to the Technical Committees, it is proposed to increase the number of working groups (task forces) and establish regional working groups in order to better cover the needs of certain regions of the world.

2.4. National Committees

The Association encourages the creation of National Committees in order to:

- represent it at a national level;
- widen its audience and increase participation in the activities of the Association;
- achieve wide dissemination of the results and recommendations arising from its work.

On 1st January 2015, there were 38 **National Committees** in 42 countries.

The Chairs and Secretaries of the National Committees meet once a year at a date that coincides with the Council meeting under the chairmanship of Bojan Leben (Slovenia) who, in 2012, was elected representative of the National Committees on the Executive Committee.

At the national level, the National Committees organize a variety of meetings, for example workshops and seminars, either on their own or in collaboration with the Technical Committees, National Road Administrations or other organizations.

In 2012 – 2015, **promotion and information** operations with regard to the role and activities of the National Committees continued and intensified with:

- dissemination of the quarterly electronic Bulletin (formerly Newsletter) which is released in English, French and Spanish; the General Secretariat is responsible for the layout and putting the Bulletin online on the website;
- recognition of new National Committees, in Ecuador and Malaysia in 2014, and in Mongolia (decision to be submitted to the Executive Committee in Seoul in October);
- provision of recommendations for the design of the National Committees website.

2.5. General Secretariat of the World Road Association

The World Road Association General Secretariat's team comprises salaried administrative staff of the Association and executives seconded to the Association by several member countries. During the 2012-2015 period, the General Secretariat office was once again relocated. The Association's Head Office is now located in the Pascal B building at La Défense, in premises provided by the French ministry for Ecology, Sustainable Development and Energy.

As of July 1st 2015, the General Secretary of the Association comprises:

- The Secretary General, Jean-François Corté, who was re-elected Secretary General at the Lucerne Council in 2012;
- A Deputy Secretary General, Robin Sébille, who took up his post in October 2013, taking over from Jean-Marc Philippeau whose secondment ended in August 2013.

Both are seconded to the Association by the French government.

- Seven salaried administrative staff (on the Association's payroll):
 - Véronique Anselin, Director's Assistant, since 1985 ;
 - Marie Pastol, Translator/Interpreter, since 1991;
 - Nathalie Sabbah, Assistant, since 1995;
 - Cécile Jeanne, Publications Assistant, since 1997 ;
 - Céline Le Graciet, Publications Advisor, since 2004 ;
 - Hanitra Rabetaliana, Accountant and management assistant, since 2008;
 - Alain Charles, Webmaster, since 2012.

- Four Technical Advisors seconded by Spain, Japan, the Republic of Korea and the Nordic Road Association (NVF) are seconded for periods varying from 9 months to more than 2 years.

Tours of duty among the technical advisors have been as follows during the relevant period of this report:

- Secondments by Korea: Byeong-Jin Lee (2011-2012), Jun-Sik Ko, as of 2012;
- Secondments by NVF: Carolina Theolin-Palmell (Sweden, 2011-2012); Seppo Toivonen (Finland, 2012-2013), Nina Knutsen-Ambro (Norway, 2013-2014), Lina-Sofia Engström (Sweden, 2014-2015);
- Secondments by Japan: Yasuyuki Matsumoto (from October 2010 to October 2012); Tomonobu Tanino (from October 2012 to October 2014); Junichi Miyazaki (as of October 2014);
- Miguel Caso Florez (Spain) has been working at the General Secretariat since 2005.

3. THE ASSOCIATION'S ACTIVITIES IN 2012-2015

3.1. Technical Committees

Seventeen Technical Committees (TC) and two Task Forces (TF) were set up and organized on the basis of the four Strategic Themes in order to deal with the issues identified in the 2012-2015 Strategic Plan. Approximately 1300 experts and decision makers from almost 60 countries and various international organizations were invited to take part in the work of TCs and TFs as members, corresponding members, or associate members.

In general, each TC met twice a year in order to carry through the work programme that was adopted in 2012. In some cases, the meetings were associated with study days, conferences or congresses, which made it possible to achieve exchanges outside the Committee and improve dissemination of results.

Prolific activity

The Technical Committees were the backbone of the:

- seminars for developing and transition countries, with the organization of **39 seminars and workshops**,
- the **SURF2012** Symposium on surface Characteristics, held in Norfolk (Virginia, USA) in 2012,
- the **14th International Winter Road Congress**, in Andorra in 2014,
- the **25th World Road Congress** in Seoul in 2015.

More information on the above events is given in Section 3.3.

For the 2012-2015 cycle, which is drawing to a close, the Technical Committees have announced the production of **54 technical reports**, the first of which were sent to the General Secretariat for publication at the end of the first half of 2015.

This section will merely give a brief survey of the goals and terms of reference, which were given to the Technical Committees in the 2012- 2015 Strategic Plan. Detailed information on the activity of all the Technical Committees and their output during this period is given in the individual Technical Committees activity reports which are annexed to this activity report.

3.1.1. Theme 1 - Management and Performance

The goal of this Strategic Theme is to encourage the development of transport policies and strategies that result in transport administrations that perform well and that are funded sustainably. Provide exemplars of good governance and transport administrations that fund their activities in an appropriate manner that incorporate best practice in respect of climate change mitigation and adaptation, and the management of associated and other forms of risk.

This theme covers the activities of the following Technical Committees: 1.1-Performance of Transport Administrations, 1.2-Financing, 1.3-Climate Change and Sustainability, 1.4-Road Transport System Economics and Social Development and 1.5-Risk Management, which have focused on the following issues:

- recommendations relating to the performance of road administrations that are more integrated to other transport modes; and that are also exposed to increased stakeholder power and media scrutiny, requiring good governance and ever more effective anti-corruption measures;
- sustainability of funding in a situation where contractual aspects of private sector funding and the associated costs of such funding are changing in the light of the global financial crisis;
- transport strategies for climate change mitigation and adaptation, as well as assessing the available tools for understanding carbon outputs and for the sustainability appraisal for transport infrastructure plans;
- evolution of road investments in relation to expected social and economic benefits and improvements to quality of life, alongside methods of long-term post-project monitoring that fully capture the benefits of schemes and plans;
- the role of risk assessment and management in policy development and decision making, road operation and emergency response, covering the study of combined and large magnitude hazards, the consequences of which are often disastrous.

ST 1 Coordinator: Friedrich Zotter (Austria)

Technical Committee 1.1 - Performance of Transport Administrations

Chairman: Brendan Nugent (Australia)

French-speaking Secretary: André Bernard (France)

English-speaking Secretary: Connie Yew (USA)

Spanish-speaking Secretary: Alberto De Benito (Spain)

Technical Committee 1.2 - Financing of Road System

Chairman: Gerardo Gavilanes (Spain)

French-speaking Secretary: Anne Pluvinage (France)

English-speaking Secretary:

Spanish-speaking Secretary: Gonzalo Ortiz Lorenzo (Spain)

Technical Committee 1.3 - Climate Change and Sustainability

Chairman: Simon Price (United Kingdom)

French-speaking Secretary: Christine Deneuvillers (France)

English-speaking Secretary: Helen Murphy (Australia)

Spanish-speaking Secretary: Juan Fernando Mendoza (Mexico)

Technical Committee 1.4 - Road Transport System Economics and Social Development

Chairman: Karl-Josef Höhnscheid (Germany)

French-speaking Secretary: Renée Okala (Cameroon)

English-speaking Secretary: Fred Amony (United Kingdom)

Spanish-speaking Secretary: Guillermo Torres Vargas (Mexico)

Technical Committee 1.5 - Risk Management

Chairman: Keiichi Tamura (Japan)

French-speaking Secretary: Étienne Quirion (Canada-Québec)

English-speaking Secretary: Yukio Adachi (Japan)

Spanish-speaking Secretary: Pedro Tomás Martínez (Spain)

3.1.2. Theme 2 - Access and Mobility

The goal of this theme is to encourage the improvement of access and mobility provided to the community and industry by improved road network operation and integration with other transport modes.

This theme covers the activities of the following Technical Committees: 2.1-Road Network Operations, 2.2-Improved Mobility in Urban Areas, 2.3-Freight Transport, 2.4-Winter Service and 2.5-Rural Road Systems and Accessibility to Rural Areas which have focused on the following issues:

- obtaining maximum benefit from existing network infrastructure thanks to improved journey time reliability by interfacing with other modes, by the use of ITS and vehicle-road cooperative systems;
- comparing strategies of urban mobility, planning transport infrastructure for multimodality; measures to promote non-motorised mobility;
- efficient interurban and urban freight management, especially through freight co-modality;
- maintaining acceptable levels of service during sustained snow events, in a context of budget cuts and climate change; provision of reliable data to road users;
- effect of national policies on accessibility of road infrastructure for rural communities and new strategies for the sustainable management and maintenance of rural roads.

ST 2 Coordinator: Hirofumi Ohnishi (Japan)

Technical Committee 2.1 - Road Network Operations

Chairman: Jacques Ehrlich (France)
 French-speaking Secretary: Sylvain Belloche (France)
 English-speaking Secretary: Richard Harris (United Kingdom)
 Spanish-speaking Secretary: Daniel Russomanno (Argentina)

Technical Committee 2.2 - Improved Mobility in Urban Areas

Chairman: André Broto (France)
 French-speaking Secretary: François Rambaud (France)
 English-speaking Secretary: Harlan Miller (USA)
 Spanish-speaking Secretary: Ricardo Arredondo (Mexico)

Technical Committee 2.3 - Freight Transport

Chairman: Don Hogben (Australia)
 French-speaking Secretary: Bernard Jacob (France)
 English-speaking Secretary: Brian R. Barber (New Zealand)
 Spanish-speaking Secretary: Carlos Santillan (Mexico)

Technical Committee 2.4 - Winter Service

Chairman: Didier Giloppé (France)
 French-speaking Secretary:
 English-speaking Secretary: Richard J. Nelson (USA)
 Spanish-speaking Secretary: José Carlos Valdecantos (Spain)

Technical Committee 2.5 – Rural Road Systems and Accessibility to Rural Areas

Chairman: Roberto Sandoval (Bolivia)
 French-speaking Secretary: Paola Villani (Italy)
 English-speaking Secretary: Dumisani Nkabinde (South Africa)
 Spanish-speaking Secretary: Alfonso Balbuena (Mexico).

3.1.3. Theme 3 - Safety

The goal of this theme is to encourage the improvement of access and mobility provided to the community and industry by improved road network operation and integration with other transport modes.

This theme covers the activities of the following Technical Committees and Task Forces: 3.1-National Road Safety Policies and Programs, 3.2-Design and Operations of Safer Road Infrastructure, 3.3-Road Tunnel Operations, TF1-Road Safety Manual and TF2-Security which have focused on the following issues:

- policies and strategies underpinning safety investment decision making; strategies used to apply systematic road safety improvements to routes and networks; integration of road safety into land use and urban planning;
- issues pertinent to vulnerable road users, driver distraction and fatigue, and the role of human factors in accident investigation;
- sustainable road tunnel operations; safety management in the light of accidents and fires; and underground road networks;
- revision and update to the Association's Road Safety Manual;
- background knowledge pertaining to transport infrastructure security.

ST3 Coordinator: Roy Brannen (United Kingdom)

Technical Committee 3.1 - National Road Safety Policies and Programs

Chairman: Matts-Åke Belin (Sweden)

French-speaking Secretary: Annie Canel (France)

English-speaking Secretary: Robert Hull (USA)

Spanish-speaking Secretary: Jesus Leal Bermejo (Spain)

Technical Committee 3.2 - Design and Operations of Safer Road Infrastructure

Chairman: Mike Greenhalgh (United Kingdom)

French-speaking Secretary: Lise Fournier (Canada-Québec)

English-speaking Secretary: Brendan Marsh (Australia)

Spanish-speaking Secretary: Roberto Llamas Rubio (Spain)

Technical Committee 3.3 - Road Tunnel Operations

Chairman: Ignacio Del Rey (Spain)

French-speaking Secretary: Marc Tesson (France)

English-speaking Secretary: Fahti Tarada (United Kingdom)

Spanish-speaking Secretary: Juan Marcet (Argentina)

Task Force 1 - Road Safety Manual

Chairman: Mike Griffith (USA)

Task Force 2 - Security

Chairman: Roberto Arditi (Italy)

3.1.4. Theme 4 - Infrastructure

The goal of this theme is to improve the quality and efficiency of road infrastructure through the effective management of assets in accordance with user expectations and government requirements while adapting to climate change and changing energy scenarios and policies.

This theme covers the activities of the following Technical Committees: 4.1-Management of Road Infrastructure Assets, 4.2-Road Pavements, 4.3-Road Bridges and 4.4-Earthworks and Unpaved Roads.

The Technical Committees have focused on the following issues:

- assessing the budget level needed to provide optimal maintenance for road infrastructure and balancing the needs of multiple assets with environmental constraints;
- technology for road condition monitoring and for increasing the service life of road pavements; and means and materials to reduce the carbon footprint of pavement materials;
- adaptation to climate change of road bridge construction, maintenance and operation, alongside repair and rehabilitation materials, risk-based management of the bridge stock and the estimation of load carrying capacity;
- optimal use of local materials in support of the 'proximity principle'; slope and foundation drainage, and storm water management for earthworks unpaved roads.

ST4 Coordinator: Oscar Gutierrez (Spain)

Technical Committee 4.1 – Management of Road Assets

Chairman: Thomas Linder (Germany)

French-speaking Secretary: Philippe Lepert (France)

English-speaking Secretary: Gerardo Flintsch (USA)

Spanish-speaking Secretary: Ricardo Solorio (Mexico)

Technical Committee 4.2 – Road Pavements

Chairman: Seung-Hwan Han (South Korea)

French-speaking Secretary: Benoît Petitclerc (Canada-Québec)

English-speaking Secretary: Ferdinand Van Staden (South Africa)

Spanish-speaking Secretary: José Del Cerro (Spain)

Technical Committee 4.3 – Road Bridges

Chairman: Satoshi Kashima (Japan)

French-speaking Secretary: Louis-Marie Bélanger (Canada-Québec)

English-speaking Secretary: Dimitrios Konstantinidis (Greece)

Spanish-speaking Secretary: Pablo Diaz Simal (Spain)

Technical Committee 4.4 – Earthworks and Unpaved Roads

Chairman: Paul Garnica (Mexico)

French-speaking Secretary: Thierry Dubreucq (France)

English-speaking Secretary: Andrew Bosco (Australia)

Spanish-speaking Secretary: Aurea Perucho (Spain)

3.1.5. Committee on Terminology

The goals of the Committee on Terminology are as follows:

- update the existing version of the terminology data base, including ongoing upgrading of the English and French versions of the various dictionaries;
- increase the number of languages of translation of the various dictionaries in liaison with the member countries of the World Road Association.

Chairman: Daniël Verfaillie (Belgium)

French-speaking Secretary: Robin Sébille (France)

English-speaking Secretary (acting): Annelies Glander (Austria)

Spanish-speaking Secretary: Cristina Higuera Toledano (Spain).

3.2. Productions and Communication

The World Road Association makes its activities and output known by means of a variety of media which complement each other in terms of their content, form and mode of dissemination:

- a website www.piarc.org;
- an electronic newsletter;
- Routes/Roads, which is a quarterly printed bilingual magazine (French/English), with a digital version "e-Routes/Roads" introduced in 2014.
- technical reports and other documents produced by the Technical Committees;
- the proceedings of international congresses and seminars organized by the Association;
- communication documents;
- participation in the exhibitions of a number of events.

3.2.1. The Website

The website has become the main tool for the Association's communication activities and operation.

A more resourceful and attractive website

The website, which was fully restructured for the Mexico World Road Congress in 2011, is regularly updated in English, French and also in Spanish, with valuable assistance from *Asociación Técnica de Carreteras* based in Madrid. The natural referencing system provides great visibility on the web. The new PIARC website search engine makes easier for visitors to access the many document resources contained in it. In addition, the classification of publications in the Virtual Library is now more intuitive. Lastly, functions such as online payment facility for membership subscriptions have been introduced.

An increase in site traffic in the course of the cycle

The above improvements have been fruitful, leading to a considerable increase in the number of visitors of the PIARC websites.

The Association's various websites

During 2011, year of the previous World Road Congress, the number of visits recorded reached 96,201 for 322,693 pages viewed! Since then, the statistics have evolved as follows, including peaks with 1200 visits/day.

Website: www.piarc.org

Periods	01/08/2012–31/07/2013	01/08/2013–31/07/2014	01/08/2014–31/07/2015
Number of visitors	133 748	141 660	119 542
Number of single visitors	76 636	85 647	77 113
Number of page views	649 116	610 728	520 139
Average number of pages per visit	4,85	4,31	4,35
Average duration of visits (mn)	4:18	3:59	3:57

For the satellite website "Road Tunnels Manual", statistics are as follows over the same period:

Website: www.tunnels.piarc.org

Periods	01/08/2012–31/07/2013	01/08/2013–31/07/2014	01/08/2014–31/07/2015
Number of visitors	23 165	32 975	30 285
Number of single visitors	18 193	27 814	25 187
Number of page views	71 837	80 823	78 367

Regarding the www.piarc.org website, below are the statistics related to the Virtual Library and the Terminology database.

Visits to the PIARC Virtual Library

Periods	01/08/2012–31/07/2013	01/08/2013–31/07/2014	01/08/2014–31/07/2015
Number of visitors	34 820	35 354	28 544
Number of single visitors	19 735	20 191	18 120
Number of page views	103 410	105 078	81 508

Visits to the Terminology database

Periods	01/08/2012–31/07/2013	01/08/2013–31/07/2014	01/08/2014–31/07/2015
Number of visitors	25 868	36 039	30 626
Number of single visitors	16 183	23 323	19 381
Number of page views	129 657	155 380	114 387

The decrease in the number of visitors can be explained by two factors:

- French legislation which requires users' consent before "cookies" are installed;
- only a few new releases of Technical reports published over the period.

As the Association's policy is to ensure a wide dissemination of its publications free of charge, it is possible to download them from the website.

Since the end of 2014, it is also possible to collect data on the downloading of documents. Over the July 2014-July 2015 period, the number of downloads reached 43,299 for a total of 3,574 documents. The top 10 most downloaded documents over the period are:

	Number of downloads
The importance of road maintenance	1 136
Road transport system and environment preservation - Review of national policies	561
Annual Report 2013-2014 - World Road Association	547
Fire and Smoke Control in Road Tunnels	540
The importance of road maintenance	532
Snow and Ice Databook 2014	532
Summary and Table of contents "The importance of road maintenance"	523
Human factors in road design. Review of design standards in nine countries	451
Road accident investigation guidelines for road engineers	402
Risk evaluation, current practice for risk evaluation for road tunnels	400

3.2.2. The Electronic Newsletter

An Electronic Newsletter published in English, French and Spanish has been released every 2 to 3 months since June 2005. It aims to draw attention to the events organized by the Association, and provides notification of new publications, etc.

It also publicizes the National Committees Bulletin. The Electronic Newsletter is disseminated in 2015 to a readership of over 15,000. The page layout of the Newsletter has been redesigned in spring 2015, to make the reading more attractive, and also with the intention to make sure that the contents of the Newsletter make better connections with the contents of the website.

3.2.3. "Routes/Roads"

This magazine is the World Road Association's printed vehicle of communication which complements the information and results disseminated by the website www.piarc.org and the Electronic Newsletter.

This bilingual English-French magazine is distributed in 142 countries and has a quarterly print run of 5,700. Over this cycle, the content of the majority of issues was articulated around a topic identified with the related Technical Committee(s) for the "Features" section.

A diversified technical magazine

The topics covered since the Mexico Congress have been as follows: Urban Mobility (n°354, n°365), The next generation of roads (n°355), Assessment of road projects (n°356), Climate change (n°357), Freight transport (n°358), Road safety (n°359, n°360), International Winter Road Congress (n°361, n°362), Rural Roads (n°362), Special issue on REAAA (n°363), Integrated risk management (n°364), Road asset management (n°366).

The section entitled Forum for National Committees has featured articles from: Portugal, Canada, Argentina, Uruguay, United States, Chile, United Kingdom, Slovenia, Japan, Italy, Korea, Ecuador, Romania, France, and Malaysia.

In addition to the editorial content, a main evolution was introduced in spring 2014, i.e. a fully digital version of the magazine “e-Routes/Roads”, along with the printed version, which remains a reference publication. « e-Routes/Roads » is available on <http://routesroadsmag.piarc.org> and provides readers most articles of the printed version, with a layout adapted to the device used, whether computer, tablet or smartphone. Readers can also leave comments online and exchange with other readers on the topic of the articles.

3.2.4. Technical Reports

After the Mexico Congress in September 2011, the General Secretariat published 52 reports which the Technical Committees had produced during the 2008-2011 work cycle, out of which 51 in English, 38 in French and 10 in Spanish.

For the 2012-2015 cycle, which is drawing to a close, the Technical Committees have announced the production of 54 reports. At the end of the first half of 2015, the very first of these had been sent to the General Secretariat for publication. Publication will be in electronic form as PDF files on the Association’s website and will begin in the second half of 2015 and continue in 2016.

To coincide with the 14th International Winter Maintenance Congress in Andorra in 2014, Technical Committee 2.4 *Winter Service* published the fourth edition of the **Snow and Ice Databook** (SIDB 2014EN) which presents the state of the art on winter maintenance practices in 28 member countries.

Since the resolution that was adopted by the Council in Beijing in 2005, the technical reports and the articles that are published in Routes/Roads can be accessed by the public free of charge from the “Virtual Library” on the website <http://www.piarc.org/en/publications/>. In mid-2015, 258 Technical Reports and 406 articles are on line.

COMMITTEE	REPORT TITLE	REFERENCE	LANGUAGES
	Cycle 2004-2007		
3.1	Road accident investigation guidelines for road engineers	2013R07	EN
	Cycle 2008-2011		
A1	Monitoring of environmental impacts of roads	2012R03	EN/FR
A1	Alternative solutions for fossil fuels for the road system	2014R01	EN/FR
A1	Road transport system and environment preservation - Review of national policies	2014R03	EN
A2	Financing, Contracting and Managing of Road System Investment	2012R08	EN/FR
A3	Worldwide situation of road pricing and assessment of its impacts	2012R01	EN/FR
A3	Approaches to evaluation of social impacts of road projects	2012R19	EN/FR
A4	Best practices for the sustainable maintenance of rural roads in developing countries	2013R01	EN/FR
A4	Practices on involvement of local community in rural roads	2013R11	EN
B1	Improved services for customers	2012R07	EN/FR
B1	Human resources for the future	2012R11	EN/FR
B1	Best practices of good governance - Institutional integrity	2012R17	EN/FR
B1	Institutional integrity - Toolkit	2012R18	EN/FR
B2	The connected vehicle	2012R02	EN
B2	Strategies for road networks operation	2012R26	EN/FR
B3	Strategies for balancing urban transport to improve mobility and reduce road congestion	2013R02	EN/FR
B4	Public sector governance over urban freight transport	2012R15	EN/FR/SP
B4	Guide to implement freight vehicle transport management	2012R16	EN/FR/SP
B4	A study of winter service management systems and road user information	2012R35	EN/FR
B4	Intermodal freight terminals - Challenges and good practices	2013R05	EN/FR
B5	Communication with road users in winter conditions	2013R03	EN/FR
B5	Sustainable development and winter service	2013R04	EN/FR
B5	Impacts of changes in winter severity on winter maintenance	2013R13	EN/FR
C1	Improvements in safe working on roads	2012R29	EN
C1	Human factors in road design. Review of design standards in nine countries	2012R36	EN
C2	State of the practice for Cost-Effectiveness Analysis, Cost-Benefit Analysis and Resource Allocation	2012R24	EN
C2	Best practices for road safety campaigns	2012R28	EN/SP
C2	Comparison of national road safety policies and plans	2012R31	EN
C3	Managing risk in road organization	2012R13	EN/FR
C3	Road safety inspection guidelines for safety checks of existing roads	2012R27	EN
C3	Social acceptance of risk and their perception	2012R30	EN/FR
C3	Risks associated with natural disasters, climate change, man-made disasters and security threats	2013R12	EN/FR

C4	Road tunnels: vehicle emissions and air demand for ventilation	2012R05	EN/FR
C4	Recommendations on management of maintenance and technical inspection of road tunnels	2012R12	EN/FR/SP
C4	Life cycle aspects of electrical road tunnel equipment	2012R14	EN/FR/SP
C4	Assessing and improving safety in existing road tunnels	2012R20	EN/FR
C4	Risk evaluation, current practice for risk evaluation for road tunnels	2012R23	EN/FR
C4	Best practice for road tunnel emergency exercises	2012R25	EN/FR/SP
C4	Prioritisation of bridge rehabilitation works	2012R32	EN
C4	Increase the durability and lifetime of existing bridges	2012R33	EN
C4	Road bridges improvement of durability in design and construction	2012R34	EN
D1	Allocation of resources across asset classes	2012R21	EN/FR/SP
D1	High level management indicators	2012R22	EN/FR/SP
D2	Dealing with the effects of climate change on road pavements	2012R06	EN/FR
D2	Reduction of construction time and cost of road pavements	2012R09	EN/FR/SP
D2	Evaluating the performance of automated pavement cracking measurement equipment	2012R10	EN/FR
D2	Guide for maintenance of concrete roads	2013R06	EN/FR
D2	Maintenance methods and strategies	2013R08	EN/FR/SP
D2	Monitoring of innovation in road pavements	2013R09	EN/FR
D2	Quiet pavement technologies	2013R10	EN
D4	Vulnerability of Geotechnical Infrastructure to Climate Change and Adjustment Measures According to the Geographical Context	2012R04	FR
D4	Innovative approaches towards the use of locally available natural marginal materials	2012R37	EN/FR
Cycle 2012-2015			
GE2	Security of road infrastructure	2015R01	EN

3.2.5. Electronic handbooks

In a number of subject areas, in addition to the publication of technical reports on targeted issues, the Association is engaged in the production of electronic manuals designed to be a reference base of the best practices in those areas. A common platform for the website of the manuals was developed under the leadership of the General Secretariat in 2014.

The first manuals of this new generation will be presented for the first time to the public at the Congress in Seoul. These are:

- Manual on Road Network Operations and Intelligent Transport Systems,
- Road Safety Manual,
- the Road Tunnels Manual.

The **Manual on Road Network Operations and Intelligent Transport Systems** was developed with ITS America and financial support from FHWA. Around 20 experts were involved in the drafting process of the Manual. This electronic manual is an update of the previous report on road network operations and features a fully new version of the section on ITS. The manual presents the range of ITS tools and services available for the road transport sphere and the deployment methods with many examples of implementation.

The **Road Safety Manual** preparation has benefited from collaboration from WHO, the World Bank, the International Transport Forum, the African Development Bank, the Asian Development Bank and the 2 PIARC Technical Committees dealing with road safety. The Manual, which aims to promote the « Safe systems » approach in the national road safety policies, represents a major contribution of the Association to the United Nations Decade for Road Safety.

The drafting of the manual has been entrusted to ARRB Group (Australian Road Research Board) under the editorial responsibility of Task Force 1. The administrative management and web developments were carried out by the General Secretariat.

The **Road Tunnels Manual** was developed within the PIARC Technical Committee on Road Tunnels Operations. After a first electronic version released online on the occasion of the Mexico Congress in 2011, a second version has been developed on the new platform and will be operational for the Seoul Congress. As at 2015, the Manual on Road Tunnels is available in English, French, Arabic, Chinese, Korean, Spanish, Italian, Japanese and Czech.

3.2.6. Terminology

The Committee on Terminology has continued the ongoing updating process of the various multilingual technical dictionaries and lexicons available in electronic format; this includes the updating of the part of the database related to intelligent transport systems, in association with the Nordic Road Association (NVF). Lastly, the various specialized dictionaries of the Terminology database have been merged into a single PIARC Road Dictionary.

3.2.7. Proceedings of the World Road Congresses and Winter Road Congresses

In the first half of 2012, the General Secretariat, together with the Mexican Organizing Committee, produced and disseminated the DVD containing the final proceedings of the **XXIVth World Road Congress held in Mexico**.

The organizing Committee of the **XIVth International Winter Road Congress** has produced, in cooperation with the General Secretariat, the proceedings of the Congress it held in Andorra in 2014.

3.2.8. Communication documents

The presentation brochure is regularly updated, especially on the occasion of the events in which the Association takes part. It is available in English, French and Spanish.

In cooperation with the Communications Communication, two new documents have been prepared for the Seoul Congress:

- an update of the brochure about the membership benefits brought by the Association to collective and individual members;
- a brochure presenting the flagship products of the Association.

3.2.9. Participation in exhibitions and congresses

Since 2012, the General Secretariat has participated in a number of exhibitions organized in connection with international conferences to promote its own activities and congresses, and particularly:

- Via Nordica 2012, in Reykjavik in 2012;
- Transportation Research Board in Washington, D.C. in 2013, 2014 and 2015;
- 17th IRF World Conference, Riyadh, 2013;
- 14th International REAAA Conference, Kuala Lumpur, in 2013;
- 28th International Baltic Road Conference, in Vilnius in 2013;
- International Transport Forum, Leipzig, in 2015;
- Transportation Research Arena, Paris, in 2014;
- Pavement Preservation and Recycling Summit, Paris, in 2015.

In addition, the President and the General Secretariat have represented the Association at various events organized by National Committees, i.e.: Argentina, Canada, Korea, France, Italy, Japan, Mexico, Spain, United Kingdom, United States.

3.3. Congresses

3.3.1. World Road Congress

The principal goal of the World Road Congresses, which are organized every four years by the Association and a member country, is to bring together decision-makers and experts from the worldwide road and road transport sector to present and discuss recent experience and trends.

XXIVth World Road Congress, Mexico, 26-30 September 2011

The XXIVth World Road Congress attracted more than 4,800 participants from 107 countries. Its general theme was “Roads for a better life”, and the Congress programme included 38 half-day sessions (Technical Committees, Special Sessions, etc.).

The Ministers’ Session brought together 33 Ministers who participated in three roundtable discussions on the topic of “Sustainable mobility within social policy”.

In addition, more than 3,600 participants took part in the Congress exhibition which featured 165 exhibitors and included 18 national pavilions. The World Road Association was present at the exhibition and presented in a single space its output, i.e. website, publications, the HDM4 software package, and the activities of the National Committees through a series of presentations held throughout the Congress.

The double issue of Routes/Roads No. 352-353 of January 2012 was entirely given over to the Mexico Congress and included the General Report.

The final proceedings of the Mexico Congress were prepared, published and disseminated in 2012.

XXVth World Road Congress, Seoul, 2-6 November 2015

The XXVth World Road Congress will take place in Seoul (South Korea) from 2 to 6 November 2015. Its general theme will be “Roads and Mobility – Creating New Value from Transport”.

The official languages will be English, French, Korean and Spanish.

Information and registration are available on the Congress website which is designed and managed by the Congress host: <http://www.piarcseoul2015.org>

In addition to the four Strategic Direction Sessions organized by the Theme Coordinators and the eighteen Technical Committee Sessions, the Congress programme includes 14 Special Sessions organized by the World Road Association jointly with other international organizations as well as workshops.

A very successful call for individual papers

The call for individual papers issued by the Technical Committees met with considerable success, and more than 800 proposals of abstracts have been received from 83 countries. 377 individual papers were selected after review by the Technical Committees.

XXVIth World Road Congress, Abu Dhabi, Autumn 2019

The Council meeting held in Santiago de Chile (29-30 October 2014) selected the application from Abu Dhabi (United Arab Emirates) for hosting the XXVIth World Road Congress. It will take place from 6 to 10 October 2019.

3.3.2. International Winter Road Congress

XIVth International Winter Road Congress, Andorra, 4-7 February 2014

The XIVth International Winter Road Congress was held in Andorra La Vella (Principality of Andorra) from 4 to 7 February 2014.

The general theme of the Congress was: *Reconciling road safety and sustainable development with climate change and economic crisis*. Both the Congress and the accompanying exhibition were a success, attracting some 1,500 participants from 48 countries. 150 oral presentations and 177 poster sessions have covered the 8 topics of the Congress.

For the first time, Technical Committee 3.3 Road tunnels Operations and 4.3 Road Bridges joined efforts with those of Technical Committee 2.4 Winter Service to organize the scientific content of the Congress.

At a plenary session, the ministers or top-level officials from 6 member governments shared their views on the impact of extreme climate events on the management of road networks and on the new communication modes with users during the winter season.

The second International Snowplough competition was organized as a major event of the Congress, gathering participants from 10 countries. The winner was the competing team from Andorra.

The DVD of the final Proceedings of the XIVth International Winter Road Congress prepared by the Andorran Organizing Committee was disseminated at the end of 2014.

XVth International Winter Road Congress, Gdańsk (Poland) February 2018

The Council meeting in 2013 decided that Gdańsk (Poland) will host the XVth International Winter Road Congress, to be held in February 2018. Chile's capital City, Santiago, had also submitted an application to host the Congress.

3.3.3. Symposium SURF 2012

The 7th Symposium on Pavement Surface Characteristics: SURF 2012 was held in Norfolk, Virginia (USA) on September 18-21, 2012. It covered three main themes: Data collection technologies; Understanding surface properties and their impact; Uses of the data for pavement analysis and management and performance measurement.

3.4. Projects

3.4.1. International Seminars Programme

To gain a better understanding of the needs of developing and transition countries and to encourage exchanges and knowledge transfer that involve a larger number of participants from these countries, the Council of the World Road Association confirmed that the 2012-2015 cycle would include a programme of regional international seminars. The aim was for each Technical Committee to take part in the organization of 2 seminars.

Thirteen Technical Committees have reached that target, i.e. the majority of TCs. Several TCs were even able to add a seminar or one or several workshops to their work programme. Also, four TCs have taken the initiative to organize joint seminars (involving two TCs), thus strengthening the cross-linking dimension of their activities.

In all, **31 seminars and 8 workshops were organized in 24 countries**, with the involvement of the **17 Technical Committees (TC)** as shown in the Table below:

TC	TOPIC OF THE SEMINAR	HOST CITY	DATES
1.1	Performance and Governance of Road and Transport Administrations	Arusha (Tanzania)	23-24 September 2013
1.1	Workshop: International experience and British programme « Action for Roads »	London (UK)	1st May 2014
1.1	Governance and asset management	Pretoria (South Africa)	3-4 December 2014
1.2	Workshop: Alternative financing approaches	Montreal (Canada-Quebec)	13 March 2012
1.2	Experience gained in PPP projects in the road sector: the way forward	New Delhi (India)	11-12 November 2013
1.2	Highway and road financing	Santiago (Chile)	09-10 July 2014
1.3	Road sustainability and green technology	Bali (Indonesia)	22-24 April 2014
1.4	Impact of road network investments on growth and employment	Yaoundé (Cameroon)	15 November 2013
1.5	Workshop: Risk and emergency management for roads	Osaka (Japan)	29-30 May 2013
1.5	Risk management for highway infrastructure	Merida (Mexico)	09-11 October 2013
1.5	Workshop: Road risk management	Milan (Italy)	28 May 2014

1.5	Workshop: Risk management in traffic and road operations	Adelaide (Australia)	12 March 2015
1.5	Disaster Prevention and Mitigation Technologies and Inputs from ITS in Network Operations (with TC2.1)	Xi'an (China)	12-13 November 2014
2.1	Disaster Prevention and Mitigation Technologies and Input from ITS in Network Operations (with TC1.5)	Xi'an (China)	12-13 November 2014
2.1	Urban mobility, road operations and ITS applications (with TC 2.2)	Buenos Aires (Argentina)	6-7 November 2013
2.2	Urban mobility, road operations and ITS applications (with TC 2.1)	Buenos Aires (Argentina)	6-7 November 2013
2.2	Improving mobility in urban areas	Makassar (Indonesia)	05-06 November 2014
2.3	Freight transport	Montevideo (Uruguay)	28-30 October 2013
2.3	The issue of freight transport by road in Africa	Yaoundé (Cameroon)	14-15 May 2015
2.4	Winter operations at high altitude and in extreme zones	Santiago (Chile)	4-7 June 2013
2.4	Workshop: Mobile road surface condition measurements in winter	Helsinki (Finland)	11 March 2015
2.5	Sustainable maintenance of rural roads	San Salvador (Salvador)	28-30 November 2012
2.5	Rural roads maintenance	Durban (South Africa)	27-29 November 2013
3.1	Road safety national policies and programs	Buenos Aires (Argentina)	11-12 November 2013
3.2	Building road safety capacity	Warsaw (Poland)	02-04 October 2013
3.2	Road safety and inclusive and sustainable development: current practices and prospects	New Delhi (India)	29-30 November 2014
3.3	Long tunnels	Santiago (Chile)	17-19 October 2012
3.3	Sustainable road tunnel operations	Da Nang (Viet Nam)	23-25 October 2013
3.3	Binational mountainous road tunnel operations	San Juan (Argentina)	15-17 April 2015
GE1	Workshop: Road Safety Manual	Seoul (Korea)	2-6 November 2015
GE2	Security of road infrastructure - A cost or an opportunity?	London (UK)	10-12 June 2014
4.1	Road Infrastructure Management - Current Practice and Development Prospective	Cancún (Mexico)	31 March - 02 April 2014
4.2	Strategies and methods to ensure long service life of pavements	Quito (Ecuador)	10-12 November 2014
4.2	Workshop: Concrete pavements	Seoul (Korea)	6-8 October 2009
4.3	Long span bridges: construction, maintenance and disaster resistance techniques	Shanghai (China)	23-25 October 2014
4.3	Bridge maintenance	Bucharest (Romania)	28-30 May 2015
4.4	Earthworks and pavements in arid and semi-arid pavements	Rabat (Morocco)	09-10 June 2014
4.4	Slope and road foundation drainage and stormwater management	Kuala Lumpur (Malaysia)	09-13 November 2014

 TC which has organized three seminars or workshops

 International workshop

3.4.2. The HDM-4 project

In 1996, the World Road Association took over the management of the HDM-4 Project (software for development studies and the technico-economic management of road networks). Version 1.0 was made available starting March 2000. New developments carried out by the University of Birmingham resulted in version 2 whose circulation started in 2005.

So as to comply with the request of the Council to outsource the management of the project, after an international call for tender, a concession contract was signed in August 2005 for a five-year-term with HDM Global consortium. The concessionaire is responsible for promotion, sales and help to users as well as managing the evolution of the software (see dedicated site: <http://www.hdmglobal.com/>). The very positive results of the concessionaire's action in terms of license sales as well as assistance to users led to the renewal of the concession, by decision of the Council, with HDM Global in 2010 for the 2010-2015 period, and then again in 2015 for 5 more years.

In partnership with the Mexican Institute for Transport (IMT), a Spanish version of the software has been produced in 2012 as well as the translation of the main user's manuals into Spanish.

In 2014, discussions were engaged with the World Bank to define a governance framework aiming at initiating research and development work to ensure that HDM-4 and other tools assisting road asset management can meet the changing needs of road owners, operators and lenders.

3.5. Cooperative Activities

Goal 2 of the World Road Association's Strategic Plan is to promote cooperation with other international and regional organizations which share similar aims to the World Road Association.

Cooperation involves exchanging information, coordinating work programmes to avoid redundancy and sharing resources to ensure the success of studies, congresses and international seminars.

A number of international organizations and associations have representatives on the World Road Association's Technical Committees which correspond to their activities, including the joint OECD/ITF research center, the World Bank, EAPA, Eupave, Eurobitume, ERF, IRF, the International Tunnelling Association (ITA).

3.5.1. Cooperation with regional organizations of road administrations

Cooperation with regional organizations of road administrations has been sought through:

- setting up regional groups, with DIRCAIBEA for Latin America, REAAA for Asia and Australasia, AGEPAR and ASANRA for Africa,
- workshops involving Technical Committees working on a common topic, with CEDR as regards Europe.

Moreover, the Council of Iberian and South American Road Directors (DIRCAIBEA) has organized the translation into Spanish of most Technical Reports of the 2008-2011 cycle.

The General Secretariat regularly takes part or contributes to the meetings of the Conference of European Directors of Roads (CEDR), DIRCAIBEA and REAAA.

3.5.2. Cooperation with other organizations

The General Secretariat has pursued regular contacts with the Organisation for Economic Co-operation and Development (OECD), the World Bank, the *Transportation Research Board* (TRB), for exchanges of information on ongoing work and projects.

The Association participates in the meetings of the United Nations Road Safety Collaboration (UNRSC) in order to contribute more efficiently to the United Nations Decade for Road Safety.

A joint working group was set up between the International Tunnelling and Underground Space Association (ITA) on safety issues in tunnels (COSUF).

A memorandum of understanding will be signed in October 2015 with ITS America in order to continue the cooperation initiated with the production of the Road Network Operations/ITS Manual.

4. FEEDBACK ON THE 2012-2015 STRATEGIC PLAN

As mentioned in paragraph 2.2.2, the 2012-2015 Strategic Plan had set a number of organizational goals to assist PIARC in fulfilling its mission. It is interesting to note what could be achieved in respect of each of the goals.

Goal 1: To continuously improve the management and operation of the World Road Association in order to provide members with a service that represents good value for money.

New operational modalities for some activities were tried out during the 2012-2015 cycle, i.e. the « Special Projects » for the production of documents of strategic importance, with the involvement of external consultants; externalisation of editorial work for the Road Safety Manual; creation of Regional Groups to encourage participation of low income countries in the activities of the Association; the setting up of Task Forces on targeted topics and with a term shorter than the four-year cycle. The positive results obtained will lead to the implementation of those various operating structures for the next cycle 2016-2019.

The Association also ensured that the use of communication tools is intensified. This has involved the enhancement of the website, the digital version of the magazine, online payment of membership fees, etc., so as to provide an ever improving quality of service to members.

Goal 2: Promote cooperation with regional organizations of road authorities and with other international organizations with related goals.

Cooperation with regional associations of road administrations was sought during this cycle through the implementation of Regional Groups working with several PIARC Technical Committees, as described in section 3.5. The results have varied according to the groups. The best results were achieved with the Group on Road Pavements and the one on Road Asset Management and DIRCAIBEA; and with the Group on Rural Roads with AGEPAR.

Goal 3: To host major congresses that are valuable events for setting direction for the future, provide knowledge exchange and networking opportunities among members of the road transport community, and develop a range of options that are viable from the World Road Association's point of view.

The XXIVth World Road Congress held in Paris in Mexico City in September 2011, the fifth to be held in the American continent, and the second World Road Congress in Mexico's capital city, gathered more than 8 400 participants from 108 countries in total, both at the congress and the exhibition. Around thirty countries were represented at the ministers' session.

The XIVth International Winter Road Congress in Andorra in February 2015, the first of the kind to take place in the Pyrenees, was also a great success thanks to the Andorran conviviality and to the contribution of the Technical Committee on Road Tunnels Operations and the Technical Committee on Road Bridges on issues related to operations and maintenance in winter.

These two Congresses, combined with the financial policy approved by the Council in Rome, ensure to the Association a level of income enabling to contribute to the funding of the Association projects expected by the members.

The selection by the Council of Gdańsk (Poland) to host the XVth International Winter Road Congress in 2018, and Abu Dhabi (United Arab Emirates) to host the XXVIth^o World Road Congress in 2019 (the first congress of the Association to take place in the Middle East) ensures a geographical rotation, with a favourable impact on the promotion of the Association and visibility of its activities in the various regions of the world.

Goal 4: To build and strengthen the activity and visibility of the Association at the national level.

Development of links between the activities of the Association--which by nature are international--and the expectations of national road communities is achieved first through National Committees, when they exist. The newly revamped National Committees Bulletin contributes to raising the profile of National Committees and to sharing experiences. Several National Committees also have set up or revitalized national mirror technical committees, whose task is to follow the work of the Association and disseminate results at the national level. Lastly, organizing more seminars and workshops reaching out to a wider audience, remains a valuable means to publicize the work of the Association at local or regional level, and to attract new members.

Goal 5: To develop directions designed to freely facilitate practical means for efficient and effective knowledge transfer among countries

A new partnership strategy to recognize an existing organization as a National Committee was adopted during the previous cycle. This has brought positive results with the signature of a memorandum of understanding with Argentina, the United States and Uruguay, shortly after the Mexico Congress in 2011. Thanks to this new arrangement, during this cycle, PIARC has welcomed the creation of a new National Committee in Australia and New Zealand (Austroads), in Ireland, in Canada, in Ecuador, Malaysia and Mongolia.

Goal 6: To improve participation of member governments and to increase the number of members of the road community benefiting, whether through National Committees or by direct participation, in the World Road Association Technical Committees.

Four new member governments have joined the Association over the past cycle. Thanks to a dynamic policy aiming to put emphasis on the benefits from participation in the life of the Association, the Association succeeded to slightly increase the number of governments truly active in their participation. The new arrangements mentioned above to recognize National Committees, linked to existing organizations (Goal 4), have also enabled to increase the influence of the Association within road communities that were less familiar with PIARC.

Goal 7: To develop practical means for efficient and effective knowledge transfer among countries and to produce and disseminate authoritative, impartial and interesting publications and products that address road and road transport issues

The number of members and corresponding members appointed by member countries has continued to increase (1300 compared to 1200 for the 2008-2011 cycle, and approximately 1000 for the previous two cycles). However, the number of active or regular participants has not always reached expectations.

The budget restrictions implemented in many countries have continued to impact travel opportunities and therefore the participation level in meetings and seminars for many members, hampering smooth operation of Technical Committees. However, the overall increase in the number of seminars and workshops is an encouraging signal of the interest and commitment of a growing number of countries.

The Regional Groups trial (in cooperation with AGEPAR and DIRCAIBEA) has allowed to partly meet the above concerns and organize meetings or events designed for countries having the same common issues.

Goal 8: To put transparent and rigorous financial management of the Association in the service of its purpose and to optimise its resources in order to meet future challenges.

The principles adopted have been implemented (strict management of the operating budget; safe and guaranteed investment; auditing of the accounts on a regular basis by the auditors and reporting by the President and the Secretary General). The forward-looking vision over the ongoing cycle and the development of a detailed financial strategy--allocating ordinary revenue from current operations and revenue from Congresses to the Association projects and consolidation of equity--have enabled to place the Association in a healthy situation, while keeping membership increases at a low level. Nevertheless, the efforts initiated should be continued.

Goal 9: To identify, develop and promulgate policy and practices that contribute to safer and more effective management and use of road and road transport systems within an integrated sustainable transport context.

This goal, which is key to the Association and its members, is usually achieved by the release of technical reports covering the previous work cycle (approximately 50 reports). In addition, during the 2012-2015 period, documents of a strategic purpose designed for road authorities were released:

- a report to raise awareness about the importance of road maintenance,
- a framework identifying climate change adaptation measures for road infrastructure.

5. PROSPECTS

Changes in the Operating Context

The World Road Association must take into account the needs of a diverse body of members. While national road administrations remain the primary constituency, a growing number of National Committees and interest in the Association by other sub-national authorities have created a more inclusive, but more complex, membership profile.

At its most senior levels, the World Road Association has considered how the 2016-2019 Strategic Plan can reflect the needs of the global roads community, both in terms of the substantive issues warranting consideration and the real-world priorities and work methods of road administrations in its member countries.

In general terms, the Association's strategy emphasizes two key aspects: **responsiveness** and **reach**. **Responsiveness** to the expression of needs in the selection and pursuit of topics for study. **Reach** of the results of the work achieved, with a renewed emphasis on communications, which is considered as an important issue at all levels of the organization, to better ensure that the information the Association produces reaches its desired audiences.

To achieve these results, the Strategic Plan provides for a range of working methods, Technical Committees, Task Forces, Regional Groups, Special Projects, use of external consultants, etc.

At the technical level, the Association will structure its work in Strategic Themes as in the previous cycles. The Strategic Themes include Technical Committees/Task Forces in order to facilitate communication and encourage synergies, and ensure consistent supervision by the Theme Coordinators.

For the 2016-2019 cycle, there will be five Strategic Themes:

- Management and finance,
- Access and mobility,
- Safety,
- Infrastructure,
- Climate change, environment and disasters.

The above Themes ensure continuity of the work on issues that remain of crucial importance for road authorities. They also reflect the consideration of resilience concerns for transport infrastructure as regards conditions resulting from extreme weather events and by climate change in the longer term.

Regional Task Groups will be set up to adequately address the needs of low and middle income member countries which cannot be readily addressed by the Association's Technical Committees. The World Road Association will seek to establish partnerships with international development institutions, for both technical support and consideration of the resulting information products in the context of funded aid projects.

A new strategic communication policy

Knowledge sharing is at the core of the World Road Association's mission. Over the past 20 years, with the advent and rapid development of internet and associated technologies, knowledge sharing has undergone a revolution. Technology has changed as have the needs and expectations of the Association's target audiences.

Taking due account of its recent work and current demands, the Association will continue its move toward increased use of social media with a focus on LinkedIn, launching an interactive version of the Routes/Roads magazine, and developing marketing plans for key information products.

Additionally, the Association aims to generate more frequent content. The creation of Task Forces which are expected to complete their assignments within two years, is one example. Within the Technical Committees themselves there will be greater emphasis on communicating their work in conjunction with all of their meetings, in coordination with General Secretariat.

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**COMMITTEE CTERM
TERMINOLOGY**

2012-2015 ACTIVITY REPORT

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Paola Villani, Italy (TC 2.5)

1. ACTIVITIES AND ORGANIZATION OF CTERM BETWEEN 2012 AND 2015

The Committee had seven plenary meetings:

- Paris (France), March 14-15, 2012;
- Timișoara (Romania), October 11-12, 2012;
- Tallinn (Estonia), April 29-30, 2013;
- Rome (Italy), October 7-8, 2013;
- Madrid (Spain), April 3-4, 2014;
- Brussels (Belgium), September 25-26, 2014;
- Cologne (Germany), April 23-24, 2015.

1.1 The tools

1.1.1 Hard-copy terminology documents

PIARC historically has two home-made terminology documents:

- the PIARC Technical Dictionary of Road Terms was first published in 1931. It has been the subject of eight hard-copy editions since that time; the eighth edition was released in five languages (French, English, German, Spanish, and Portuguese) at the World Road Congress in Paris (in 2007). This eighth edition contains 1,684 concepts, with definitions for approximately half of these;
- the PIARC Lexicon of Road and Traffic Engineering was first published in 1991. A second hard-copy edition was released in 2000 (now out of print). This second edition contained over 16,000 terms in English and French in common usage by road engineers, including – unlike the Technical Dictionary of Road Terms – terms used in related fields such as environment, land use, geography, mathematics and statistics, etc.

1.1.2 Soft-copy Terminology database

In 2003, Internet software was developed for a PIARC Terminology database that can be consulted on-line and allows easy addition, amendment and deletion of terms, definitions and illustrations.

In addition to the Dictionary and Lexicon described above, this database contained a number of “specialized dictionaries” in the areas of Road Transport Informatics (ITS), Sustainable Transport, Bridges, Weigh-In-Motion, and Winter Maintenance. A specialized dictionary on Road Tunnel Operations was added during the previous work cycle (see Section 1.3.2.2 of the 2008-2011 Activity Report).

Any terminology document (“dictionary”) accessible with the software can be extended with translations into other languages, and new documents can be added. In this way, an on-line electronic database is built that can be updated and upgraded any time.

The PIARC Terminology database is intended for three levels of use:

- a user can consult a dictionary for a given term; the result of the search can be displayed in up to three languages at a time;
- an editor has the additional option to make proposals for additions and amendments. These include new terms, new definitions, a new language for a given dictionary, or even a new dictionary;
- finally, the administrator, representing PIARC as the owner of the copyright of the database, validates or rejects additions and amendments directly on-line.

Since November 2006 (approval of the PIARC Council), access to the PIARC Terminology database has been free for all users, leaving only editors and the administrator needing a login and a password to be given by the PIARC General Secretariat.

The major development that took place during this work cycle is described in Section 1.3.2.2 below.

1.2 Work programme

1.2.1 General objectives

A common terminology that is understood by road professionals all over the world is instrumental in promoting technology transfer especially in developing countries, countries in transition and rural and remote areas.

In this context, the PIARC Strategic Plan developed for the inter-congress period 2012-2015 defined the following issue, strategies and objectives for CTERM:

- issue: updating and upgrading the dictionaries of the World Road Association;
- strategies:
 - seek active support from the network of correspondents from other technical committees and national committees of PIARC;
 - upgrade the software of multilingual dictionaries on the Internet;
 - promote the inclusion of specialized glossaries in PIARC publications (see Section 3.9 in Appendix B1 (2013) to Section 8 of the PIARC “Blue Guide”);
 - promote the further elaboration of PIARC terminology in languages other than English and French;
- objectives:
 - permanent updating and upgrading of the dictionaries in the Terminology database;
 - presentation of the database at national events;
 - report on work in progress for the PIARC Terminology database:
 - § short article (one page) in Routes/Roads;
 - § contribution(s) to the “News” section on the homepage of the PIARC website;
 - presence of CTERM at the PIARC World Road Congress, in a form to be defined (during the April 2015 meeting of CTERM – most probably presentations on the Terminology database at the PIARC pavilion, in several languages).

1.2.2 Organization of work

The updating and translation process for the PIARC Terminology database works mainly through editors, who may choose to work either on-line (using a login and password received from the PIARC General Secretariat) or off-line (on files in Excel format exported by the administrator of the database in the appropriate presentation in columns corresponding to the specific data fields).

There are several types of editor:

- for the basic (French and English) versions, terminology correspondents are appointed in each technical committee of PIARC. It is their task to collect terminology proposals from their committees within their specific fields of competence;
- for translations into other languages than French and English, corresponding members are appointed within CTERM by the various member countries of PIARC. They have full authority and responsibility for their translations;
- finally, the members of CTERM themselves are entitled to make proposals for French and English and may be authorized by their national committees to prepare translations into their respective languages as well.

Per PIARC technical committee (TC), one or two members of CTERM communicate(s) as (a) liaison agent(s) – appointed on the basis of nationality (language) or personal acquaintance – with the terminology correspondent(s) appointed within that committee, to encourage the correspondent(s) in his/her/their task and to facilitate the exchange of terminology data between CTERM and the committee. In the period 2012-2015, the liaison agents were:

- Annelies Glander for TCs 1.1 “Performance of Transport Administrations”, 2.2 “Improved Mobility in Urban Areas”, and 2.5 “Rural Road Systems and Accessibility to Rural Areas”;
- Robin Sébille for TCs 1.2 “Financing” and 2.1 “Road Network Operations”;
- Ariadna Nicoara for TC 1.3 “Climate Change and Sustainability”;
- Daniël Verfaillie for TCs 1.4 “Road Transport System Economics and Social Development, 2.3 “Freight Transport”, 3.3 “Road Tunnel Operations”, and 4.3 “Road Bridges”;
- Cristina Higuera Toledano for TCs 1.5 “Risk Management”, 4.1 “Management of Road Assets”, and 4.4 “Earthworks and Unpaved Roads”;
- Ann-Kristin Gjelsten for TC 2.4 “Winter Service”;
- Ada Lía González for TC 3.1 “National Road Safety Policies and Programmes”;
- Balázs Szirányi for TCs 3.2 “Design and Operation of Safer Road Infrastructure” and 4.2 “Road Pavements”;
- Mohamed Himmi for TC 4.1 “Management of Road Assets”.

After preliminary checking and commenting, the liaison agents forward the contributions received to the working group leader within CTERM (Daniël Verfaillie in 2012-2015).

This working group leader checks all the proposals to avoid any redundancies or duplications and converts them into a columned format while adding a suggestion for inclusion in the database (with or without definition), or rejection. He then circulates the list to all the members of CTERM for comments. After processing their comments, he prepares a discussion in the CTERM plenary meeting only for the terms whose difficulties could not be solved by e-mail. The list as approved by CTERM after discussion is returned to the relevant technical committee for final comments and validation.

In the end, the validated terms and definitions are put on-line by the administrator of the database.

Translations into other languages need not be checked and discussed in CTERM, as the corresponding members and their national committees are deemed to be competent for terminology in their own languages.

The fact that contributions and translations may be received and/or approved at any time between two PIARC congresses makes the updating and translating of the PIARC Terminology database a continuous process.

1.3 Current state of progress

A presentation of the Terminology database, with details on updating and developments between April 2010 and May 2014 and a call upon users and World Road Association member countries to contribute, was published in Routes/Roads No. 363 (July 2014).

1.3.1 Updating

In March 2012, a letter was sent to the chairs of the various technical committees of PIARC, explaining what CTERM was expecting from each terminology correspondent (see Section 1.2.2 above):

- mainly: to deal with the English and French versions of the chapters and subchapters of the PIARC Dictionary and Lexicon and – where applicable – with the “specialized” dictionaries (see section 1.1.2 above) most appropriate to the expertise of his/her technical committee, by making proposals for:
 - the addition of new concepts (preferably with definitions) arising in the work of his/her committee;
 - the revision of concepts already existing in these chapters and subchapters and in these specific dictionaries;
 - the addition of illustrations to both new and existing concepts, provided they are free of copyright and/or permission for reproduction can be obtained;
- additionally, to identify within his/her committee those members who are also involved in ISO and/or CEN standardization, in order to collect information on terminology work done in ISO and CEN committees that may be useful to PIARC.

After final editing, the work done during the previous work cycle by Lise Filion of the former TC B.2 “Road Network Operations” on several recent source documents in the field of intelligent transport systems (see Section 1.3.1 in the 2008-2011 Activity Report) was uploaded in July 2012.

During the period between the Mexico Congress and the drafting of this report, ten technical committees actually provided CTERM with proposals and comments for discussion and validation:

- TC 1.5 “Risk Management”.
The terminology correspondent revised a number of terms in Subchapter 3.4 “Traffic Forecast and Management” of the PIARC Technical Dictionary of Road Terms;
- TC 2.1 “Road Network Operations”.
The terminology correspondent reacted to the proposal by an Estonian user of the database for a new definition of the term “vehicle tracking”;

- TC 2.2 “Improved mobility in urban areas”.

Extensive comments were received to the lists of English and French equivalents suggested by CTERM for German terms in the subject areas of motorcyclist safety and traffic calming (see Section 1.3.1 in the 2008-2011 Activity Report);
- TC 2.3 “Freight Transport”.

At the suggestion of a member of TC 2.3, CTERM members examined European standard EN 14943 “Service transport – Logistics – Glossary of terms” and identified terms and definitions that would be interesting for PIARC terminology. It was agreed to upload the resulting document onto the website without prior double-checking by the TC, which will be invited to make remarks later on (perhaps in the next work cycle).

At the suggestion of the terminology correspondent, CTERM examined a few terms and definitions extracted from a report “Intermodal freight terminals – Challenges and good practices” prepared in July 2011 by the former TC B.4 “Freight Transport and Intermodality”;
- TC 2.4 “Winter Service”.

Comments were received to the French and English versions of Subchapter 13.2 “Winter Maintenance” in the Technical Dictionary of Road Terms.

At the suggestion the terminology correspondent, CTERM extracted a few terms and definitions from a paper “Definition of Meteorological Events” presented by Pertti Nurmi (Finland) at the PIARC Winter Road Congress in Andorra;
- TC 2.5 “Rural Road Systems and Accessibility to Rural Areas”.

Comments were received on a few specific terms (basalite, hilly road, crawler drill);
- TC 3.2 “Design and Operation of Safer Road Infrastructure”.

The terminology correspondent approved the proposal by an Estonian user of the database for a new definition of the term “vehicle tracking”.

Extensive comments were received to the list of English and French equivalents suggested by CTERM for German terms in the subject area of traffic calming (see Section 1.3.1 in the 2008-2011 Activity Report).

Comments were received to a few new terms and definitions suggested by TC 3.3 (see below);
- TC 3.3 “Road Tunnel Operations”.

The terms suggested by the various WGs in TC 3.3 were discussed with the terminology correspondent in Madrid and in Brussels. A few terms and definitions not specific to tunnels but relating to road safety (such as fatality, head-on collision, accident vs. incident, event conclusion, siren), maintenance (such as preventive maintenance, scheduled/planned maintenance, useful life), freight transport (such as HGV), etc. in general were referred to the TC’s competent in those areas.

Illustrations are being collected (preferably without text).

Details were provided to Annelies Glander on the flickering effect of lighting in long tunnels.

It was agreed that co-operation with and/or approval by the International Tunnelling and Underground Space Association (ITA) should be sought for terms related to tunnel construction;
- TC 4.1 “Management of Road Assets”.

Guy Poirier’s trilingual list of terms (English, French, Spanish) in the subject area of road asset management was discussed in Rome with a terminology correspondent and sent back to TC 4.1 for feedback and final approval;
- TC 4.2 “Road Pavements”.

Partial comments were received to the list of English equivalents suggested by CTERM for German terms in the subject area of motorcyclist safety (see Section 1.3.1 in the 2008-2011 Activity Report).

Furthermore, extensive contacts between PIARC and the Nordic Road Association (NVF) about a new (2012) version of their specialized dictionary on ITS resulted in the signing of an agreement allowing CTERM to include this new version in the PIARC Terminology database. In doing so, under the terms of the agreement PIARC was to import the dictionary in all languages provided by NVF (English, Danish, Finnish, Icelandic, Norwegian, Swedish), while acknowledging the source by mentioning “[NVF-ITS]” at the end of each definition copied. However, there was one major problem: French, one of the two official languages of PIARC, was missing.

An Excel file was prepared with two sheets:

- one collecting English and French ITS terms and definitions from the new NVF dictionary, from the old (2005) version, from a Trilingual (English-French-Spanish) Vocabulary of Intelligent Transportation Systems published (in 2009) by the Office québécois de la Langue française (OQLF), and from other PIARC dictionaries (mainly the Technical Dictionary of Road Terms and the Lexicon of Road and Traffic engineering);
- the other with suggestions for terms, definitions and translations into French to be adopted (from the new version of 2012) in the PIARC database.

After review by French-speaking members in CTERM, the proposal for terms and definitions (in English and in French) to be adopted from the new NVF dictionary was finalized. It was agreed to upload it onto the website without prior double-checking by the competent TCs, which will be invited to make comments later on (perhaps in the next work cycle).

The various finalized documents resulting from the contacts with the PIARC technical committees and the Nordic Road Association (NVF) as reported above will be uploaded as soon as all the multiple entries have been removed from the new PIARC Road Dictionary (see Section 1.3.2.3 below).

1.3.2 Upgrading

1.3.2.1 Software

During the previous World Road Congress in Mexico, the users’ part of the database was included in the PIARC website, under the tab “TERMINOLOGY” (<http://www.piarc.org/en/Terminology-Dictionaries-Road-Transport-Roads/>), while the editors’ part (the “back office”) was kept in place on a separate website (<http://admin.termino.piarc.org/login.php>). As a result, the software company Oonops developed new layouts for the users’ part, to match the general layout of the site. The “user” and “editor” help files, both in English and in French, were adapted accordingly in January 2012, in both languages.

More specifically, for the users’ part:

- several errors or functions not working were corrected or restored;
- the motto “To understand and make oneself understood” describing the mission of CTERM is now displayed on the Terminology webpage;
- the welcome page of the Terminology section was translated from French into English and Spanish;

- earlier suggestions by CTERM for creating a possibility to translate the navigation screens and help file into other languages than English, French and Spanish (see the 2008-2011 Activity report, Section 1.3.2.1) and for the embedment of a pop-up user satisfaction survey (see the 2008-2011 Activity report, Section 2.7) were declined by the PIARC General Secretariat;

and for the editors' part:

- editors from previous work cycles continuing in 2012-2015 were enabled to log in with their new password (BM0xxxx) rather than with their old one (piarcxxxx);
- the "Users list" in the administration section was updated to reflect current PIARC membership and to enable the administrator to give editing rights to new CTERM members and corresponding members and new terminology correspondents in technical committees;
- arrangements were made with the PIARC General Secretariat for the copying of illustrations from PIARC's virtual library;
- language "slots" were opened for on-line translations into Catalan, Latvian, Lithuanian, Maltese, Nepali, Polish and Turkish;
- when making translations in the back office, a button "Publication of the translation" is now available at the bottom of each list of terms, and a button "Back to the list" is now available at the bottom of the data sheet of each term.

Visit statistics were regularly monitored during CTERM meetings (see Section 2.7 below).

Other developments were suggested by CTERM to the PIARC General Secretariat:

- a "remember password" option when logging in as an editor;
- a study by the software company into the feasibility and cost of an additional development of the software for a terminology correspondent who is not a member of PIARC to be added to the "Users list" in the administration section of the database (with a view to giving him/her editing rights);
- the possibility to establish links between a term used in a definition and defined elsewhere in the same dictionary or in the database ("interlinkability");
- changing the name of the tab "TERMINOLOGY" on the PIARC website to "ROAD DICTIONARY", as the very term "terminology" is rather alien to engineers in some countries. This would make it easier for local search engines to find their way to our new dictionary (see Section 1.3.2.2 below).

1.3.2.2 Dictionaries

The work on the specialized dictionary on Road Tunnel Operations initiated during the previous cycle was continued by TC 3.3 (see Section 1.3.1 above for more details). Also, TC 3.3 continues to provide for a translation of this dictionary into as many languages as available within the TC.

As an attempt to see a similar effort undertaken for the compilation of a specialized PIARC dictionary on Bridges, an Excel file was prepared with terms and definitions extracted from Chapter 12 of the PIARC Technical Dictionary of Road Terms, Chapter 6 of the PIARC Lexicon of Road and Traffic Engineering, the Bridges dictionary of NVF and the SWECO dictionary on bridges, and sent to the terminology correspondent of TC 4.3 "Road Bridges" for completion and review.

As to the updating of the specialized dictionary on Road Transport Informatics (NVF-ITS), see Section 1.3.1 above for more details.

The idea launched during the previous work cycle to add acronyms of organizations as a new theme 17 in the PIARC Technical Dictionary of Road Terms was abandoned.

On the other hand, the systematic use of ISO standards in presenting PIARC terminology was introduced, as follows:

- ISO 10241 and ISO 704 for terms and definitions:
 - terms: lowercase, basic grammatical form (e.g. noun in singular), etc.;
 - definitions: same grammatical form as the term, not to start with an article, single phrase with examples and further details referred to notes, substitution principle, etc.;
- ISO 3166-1 for country codes used in “attributes of origin” for national variants of standard terms, e.g., AT for Austria rather than A, BE for Belgium rather than B, and US for the United States rather than USA.

1.3.2.3 The new “single” PIARC Road Dictionary

The logic adopted in the hard copy era (see Section 1.1.1 above), i.e. to have the size of PIARC dictionaries limited for reasons of printing and translation costs, no longer stands in the present soft copy era. With the computerization of the PIARC database, it has become perfectly feasible to merge the PIARC Technical Dictionary of Road Terms, the PIARC Lexicon of Road and Traffic Engineering and the various specialized PIARC dictionaries into a single dictionary. This would, moreover, solve the problem of rationally and indisputably sharing out terms between various dictionaries. Finally, as far as “quality” is concerned, an internet user making a search through our various dictionaries will place the same confidence in all the results of his search – whether they have been found in the PIARC Technical Dictionary of Road Terms (which has always been meant to be “normative”) or in any of the other dictionaries of the database.

Bearing this principle in mind, a draft table presenting a structure for this new single dictionary was prepared, with input from the PIARC General Secretariat. In this table:

- the first column presented the chapters, the subchapters and the sub-subchapters of the new single dictionary;
- the second column pointed out the dictionaries of the PIARC Terminology database – or their chapters (and sub-chapters) – from which most of the terms and definitions had to be extracted for inclusion in the respective chapters, subchapters and sub-subchapters of the new structure.

As a next step, a meeting was arranged with Oonops to prepare the new dictionary while avoiding any loss of existing data – in any language – and ensuring continuity in the service of users. The conclusions from this meeting were laid down in a document “AIPCR – Evolutions de l’application de Terminologie” with a description of the objectives, instructions for functionalities, and a timetable for the completion of the project. Under the terms and conditions stipulated in this document, Oonops put a trial version of the new unified dictionary on-line, with the structure described above. This trial version was formally approved in April 2014, and it was agreed that the unified dictionary should be named “PIARC Road Dictionary” / “Dictionnaire AIPCR de la Route”.

During the creation of the trial version, whenever a given chapter (or subchapter, or sub-subchapter) of an existing dictionary was to feed several chapters (of subchapters, or sub-subchapters) of the PIARC Road Dictionary, Oonops systematically imported ALL the concepts from the old chapter in EACH of the new chapters it was to feed. As a result there are now many double (or triple, or even quadruple) and sometimes conflicting entries in the new dictionary. Removing these is a huge task which needs to be done very carefully in order not to lose any existing data in any language; CTERM hopes to be able to finish it before the Seoul Congress or, if not, certainly before the start of the revision procedure by the technical committees in the next work cycle.

All existing dictionaries will be deleted when the new PIARC Road Dictionary is ready for use (i.e., after all the multiple entries have been removed). As a result, the help files and the presentation texts on the PIARC website, which still refer to the existing dictionaries, will have to be revised and updated.

1.3.3 Translations into other languages

Such translations will always be one step behind, as new English and French terms are continuously added. However, once a translation has been completed to 100 % a good practice for the country concerned would be to nominate someone to periodically review English or French revisions and thus maintain the standard of the Dictionary with comparatively little effort.

A review of work done by CTERM members and corresponding members on, or contacts made or planned by CTERM for, translations into other languages than English and French is presented below.

From a general point of view, as far as the impact of the new PIARC Road Dictionary is concerned:

- the new structure (see Section 1.3.2.3 above) was translated into thirty-four languages (all the languages present in the data base (except Mongolian) plus a few others for which a new “slot” was opened – see Section 1.3.2.1 above). Contacts will be made with Turkic countries to have the new structure translated into their languages (Azerbaijani, Kazakh, etc.);
- the access rights of editors working on translations have now been restricted to this new dictionary. This means that editors can no longer work on on-line translations of other dictionaries (including the PIARC Technical Dictionary of Road Terms) still present in the database. This has been done to avoid the need for manual copying of translation work during the transition period or, worse still, loss of that work;
- the reference to the original dictionary will be kept when the new dictionary is ready for use. This will make it easier for “foreign” language editors to select the “basic” terms (i.e. those marked with “[PIARC Dictionary]”).

1.3.3.1 Arabic

Unlike e.g. for Dutch, where the reference would be the Netherlands, or Latin American Spanish, where the reference would be Spain, there is no such country for Arabic. Moroccan Arabic is different from that in the Middle East. The Arabic translation of the PIARC Technical Dictionary of Road Terms as available in the existing hard copy editions is not up to the standard required.

Work on checking proposed Saudi terms and definitions of the PIARC Technical Dictionary of Road Terms and comparing them with the existing (Moroccan) Arabic terms is under way and it is hoped to make good progress in the near future. Mohamed Himmi's contacts with other experts working on similar issues (in Egypt, with a Moroccan centre for arabization) and an unpublished document with the work done since 1995 by the Permanent Committee of Roads in Libya for AMU (Arab Maghreb Union) may be useful for this work.

Mohamed Himmi commented on the draft Arabic translation of the specialized dictionary on Road Tunnel Operations. The translation has been on-line since November 2013 and Chapter 15 of the Technical Dictionary of Road Terms was adapted accordingly.

Contacts will be made with a view to obtaining input of specific Jordan Arabic terms.

1.3.3.2 Catalan

Contacts were made with Andorra (David Palmitjavila) on the occasion of the 14th International Winter Roads Congress.

1.3.3.3 Chinese

A translation of the specialized dictionary on Road Tunnel Operations has been on-line since September 2012.

1.3.3.4 Croatian

There has been no progress on the Croatian version of the Technical Dictionary of Road Terms. Mate Sršen, a professor at Rijeka University who joined PIARC as an individual member, is missing local technical assistance to start work, as all his efforts to establish connection with the head of the national road authority have failed.

The work done by a Croatian student in Austria on files extracted from Mate Sršen's Four-lingual Dictionary of Road Engineering (English, French, German, and Croatian) could be used as an input.

1.3.3.5 Czech

Petr Komárek is maintaining the database.

He uploaded the Czech translation of the new specialized dictionary on Road Tunnel Operations in March 2012, and copied the relevant terms and definitions to Chapter 15 of the Technical Dictionary of Road Terms.

Further work may be affected by planned changes in the Czech administration.

1.3.3.6 Dutch

Dutch translations are systematically checked when deleting multiple entries from the PIARC Road Dictionary.

A Dutch translation of the specialized dictionary on Road Tunnel Operations was approved and is on-line.

1.3.3.7 Estonian

A language group has been set up within the Estonian road administration in order to establish proper official Estonian terms on transport-related issues. Kuno Männik is helping the Estonian Roads Administration to update the translation of the Technical Dictionary of Road Terms, which has been on-line since December 2011.

1.3.3.8 Finnish

A translation of the specialized dictionary on Road Tunnel Operations has been on-line since March 2015.

1.3.3.9 German

With Annelies Glander (Austria), Hans Walter Horz (Germany) and François Guenot (Switzerland), three German-speaking countries are represented in CTERM. It was agreed to give the on-line editing rights to Mrs Glander, with a deadline to be set for Messrs Horz and Guenot to comment on her proposals for German terms. German from Germany is to remain the reference, with Austrian and Swiss equivalents denoted by AT and CH, respectively.

Annelies Glander worked on the database with her students on different topics, as part of a university project.

Final corrections were made to the German version (on-line since November 2012) of the new specialized dictionary on Road Tunnel Operations.

The German terms in the subject areas of motorcyclist safety and traffic calming (see Section 1.3.1 in the 2008-2011 Activity Report) will be entered as soon as their approved English and French equivalents have been uploaded in the PIARC Road Dictionary.

1.3.3.10 Hebrew

In February 2015, a proposal was received from Israel for undertaking the translation of the database.

1.3.3.11 Hungarian

Since the dissolution of his small group working on the translation (owing to retirements), Balázs Szirányi has been working with two new colleagues and there has been some progress for the PIARC Technical Dictionary of Road Terms – albeit slow, due to an overload of work.

1.3.3.12 Italian

During the transition period between the creation of the new PIARC Road Dictionary and the restriction of access rights (see Section 1.3.3 above), Paola Villani did some translation work in the Technical Dictionary of Road terms (checking terms while including new illustrations and adding meanings for several particular contexts). This work is in progress into the new dictionary: 16,000 terms verified with English and French.

Also, Mrs Villani replied to a question by Cindy Mittelette about “rampa di svincolo”.

1.3.3.13 Japanese

A translation of the specialized dictionary on Road Tunnel Operations has been on-line since September 2012.

1.3.3.14 Korean

The translation level is currently very low. Progress in that direction is to be encouraged in the prospect of the Seoul Congress.

1.3.3.15 Latvian

Laura Linkeviča (Latvian State Roads) put a partial translation of the Technical Dictionary of Road Terms on-line in February 2013, including only officially accepted terms. Latvian State Roads are currently looking forward to make the second step and provide Latvian translations for a larger number of road terms, but the actual procedure (in-house or by attracting other experts or consultants) has not been decided yet.

1.3.3.16 Lithuanian

Exports of the Technical Dictionary of Road Terms were sent to Dalia Šalkauskienė, to help her get started.

1.3.3.17 Maltese

The Maltese road administration was contacted in May 2014 and January-February 2015 (Simon Grima and Robert Zerafa).

1.3.3.18 Mongolian

The Mongolian road agency was contacted in January 2015.

1.3.3.19 Norwegian

Ann Kristin Gjelsten checked the draft Norwegian translation of the specialized dictionary on Road Tunnel Operations. The translation has been on-line since February 2014 and Chapter 15 of the Technical Dictionary of Road Terms was adapted accordingly.

Since the Norwegian public roads administration has introduced a cost savings programme, it is difficult to find approval and support for an update of the Norwegian version of the Technical Dictionary of Road Terms.

1.3.3.20 Persian

The translation of the Technical Dictionary of Road Terms is complete (on-line since April 2012).

A Persian translation of the specialized dictionary on Road Tunnel Operations was approved and is on-line.

At the time of drafting of this report, about 10 % of the translation work for the new merged dictionary is complete.

1.3.3.21 Polish

Contacts were renewed with the Polish road administration (Aleksandra Cybulska), especially with a view to the next PIARC International Winter Road Congress being held in Gdańsk in 2018.

An outdated (1986!) hard copy version of a Polish translation of the Technical Dictionary of Road Terms could be used as a basis.

1.3.3.22 Portuguese

Daniël Verfaillie replied to Dayse Simon about PIARC's interest to insert a short glossary of Brazilian terms in the field of large structures in the PIARC Technical Dictionary of Road Terms or the PIARC Lexicon of Road and Traffic Engineering.

1.3.3.23 Romanian

Ariadna Nicoara, who attended several CTERM meetings as a corresponding member, has been reporting difficulties to get support. Romanian experts tend to prefer the paper copy.

She has not been able to make much progress in the translation of the Technical Dictionary of Road Terms, owing to work overload (new responsibilities within her office).

1.3.3.24 Russian

Contacts with the Russian road administration will be renewed, as the country has recently marked its interest in re-establishing ties with PIARC.

1.3.3.25 Serbian

Efforts will be made to check whether it is possible to go further if the recent contacts for Serbia to join PIARC prove successful.

1.3.3.26 Slovak

Contacts were made with the Slovak PIARC Committee (Bystrík Bezák and Lucia Polčíková).

1.3.3.27 Spanish

After the Congress in Mexico, Cristina Higuera Toledano continued her effort both for reviewing the "reference" Spanish terms and entering Latin American phraseology, by entering terms from a list prepared by DIRCAIBEA (the council of road directorates of Iberia and Latin America).

She worked on the Spanish translation of some chapters of the Technical Dictionary of Road Terms with inputs from Enrique Belda-Esplugues (TC 1.5) for Subchapters 3.4 "Traffic Forecast and Management" and 3.7 "Information and Telematics" and Chapter 16 "Environment, Nuisance, Accidents", and from Oscar Gutierrez-Bolivar (TC 4.1) for Chapters 5 "Components of the Road" and 11 "Quality, Faults and Tests". In addition, she updated sixty-three new terms in Chapter 15 "Tunnels", using the Spanish translation of the specialized dictionary on Road Tunnel Operations as a basis.

A question from Aurea Perucho Martinez (TC 4.4) about "rigola" versus "canaleta" or "canalón" was forwarded to her. A new technical dictionary in Spanish (El Diccionario español de ingeniería) could be used as a reference in further work.

Spanish may gain importance in the years to come, in the light of Executive Committee's recent direction to advance the use of Spanish in PIARC.

1.3.3.28 Swahili

Contact was made with Joseph Haule.

1.3.3.29 Turkish

Oğuz Sehtiyanci provided Turkish translations for a number of terms in Chapters 1 “Types of Road” and 2 “Design and Geometry” of the Technical Dictionary of Road Terms, which have been on-line since July 2014.

1.3.3.30 Vietnamese

A translation of the specialized dictionary on Road Tunnel Operations has been on-line since March 2015.

1.3.4 Internet terminology services

Throughout the 2012-2015 period, CTERM has continuously received requests, comments and suggestions by common users of the database completing and sending a form which is displayed after clicking “Submit your remarks on this term” at the bottom of a sheet showing the result of a term search. Examples include:

- a question by Alain Lefebvre about “(safety) drums”;
- a request by Meljo Musto for a new definition of “vehicle tracking”;
- questions by Jean-François Edelmann about possible synonymy between French terms: “aire de casse-croûte” vs. “aire de repos” and “voie supplémentaire en rampe” vs. “voie pour véhicules lents”;
- a comment by Alex Greenland to the term “successive overhangings”;
- a request by Mick Lorenz for a definition of “road surface”;
- a question by Nathalie Pollet about “signing” and “signage” in the context of traffic signs;
- a request by Paola Villani to delete “basalite” (which is a commercial product) as a synonym of “basaltine”;
- questions by Paola Villani about the equivalence between French and English terms: “route accidentée” vs. “hilly road”, “repérage” vs. “logging” and “pince” vs. “clip (syn. clamp)”;
- questions by Fadime Kokkaya about:
 - “single carriageway road” and “undivided highway or undivided road”;
 - the definition of “average speed”;
 - the definition of, and possible synonymy between, “traffic density”, “traffic intensity”, “traffic volume” and “traffic concentration”;
 - possible synonymy between “running speed”, “cruising speed”, “free speed” and “free-flow speed”;
- questions by Michael Beijer about “flashing amber” versus “flashing yellow” and “remote-controlled signing” versus “remote-controlled signalling”.

Other questions of a more technical nature (e.g., allowable depth of a water film on a road surface before the water reaches its outlet) were forwarded to the competent technical committees, or the user was referred to PIARC’s virtual library (e.g., for publications on tar concrete and bimodal semi-trailers).

It should be pointed out that this possibility for users to submit remarks is also making PIARC vulnerable to advertising e-mails.

2. FUTURE ACTIVITIES

2.1 Composition of CTERM

An ideal team for the Committee on Terminology would have active native English (missing during this work cycle!), French and Spanish-speaking secretaries – in addition to members representing a maximum number of languages, to promote the involvement of national committees (see Section 2.3 below) with a view to enriching the database with translations into other languages. Such was the case in 2012-2015 for Arabic, Czech, Dutch, Estonian, German, Hungarian, Italian, Latvian, Lithuanian, Persian, Romanian, Spanish and Turkish. For 2016-2019, their continued presence would be most desirable (to keep the database up to date), as would be extensions to further languages.

Members from countries outside Europe may be corresponding members, to reduce costs of travel.

CTERM membership should be a good mix of technically minded linguists and engineers with technical skills and experience in the subject matters to be dealt with.

2.2 Involvement of the technical committees

CTERM is composed of a limited number of members whose knowledge and competence do not cover the full range of subject areas dealt with in PIARC and, particularly, the specialities within these areas. Although all PIARC technical committees have appointed terminology correspondents, it has been the experience of CTERM that, with a few exceptions reported in Section 1.3.1 above, the response of the terminology correspondents to the calls of the liaison agents for proposals has been rather poor. **Input for the revision of the PIARC Road Dictionary must come from the technical committees.** The PIARC Road Dictionary should be the reference work of the technical committees that are active within PIARC. It is in their interest to revise terminology and transmit specialized vocabulary in their specific areas of expertise to CTERM.

One way to enhance the involvement of technical committees could be to have all terminology correspondents attending the second CTERM meeting (about one year) after each PIARC World Road Congress or to have TC members invited to attend CTERM meetings from time to time – especially from the committees that never react.

On the other hand, CTERM would like to see the recommendation for technical committees to include a bilingual “terminology” section (French-English) in each specialized technical report maintained in the Blue Guide for 2016-2019. In addition, technical committees should be requested to send those terminology sections to CTERM before the reports are published.

Finally, it has been reported to CTERM that technical committee members and corresponding members are sometimes reluctant to work on terminology as long as this task is not formally included in their terms of reference.

2.3 Involvement of the national committees

The work and products of CTERM are still little known to the national committees of PIARC. The circle of editors of the PIARC Terminology database also includes national terminology correspondents to be designated by the First Delegate in each PIARC member country, in order to translate and/or revise terminological information in the language of their country.

Translations of the basic versions of the PIARC Road Dictionary into other languages are the responsibility of the respective national committees. The involvement of these committees should be encouraged in order to make maximum use of the multilingual potential of the on-line PIARC Road Dictionary.

2.4 Contents of the PIARC Road Dictionary

The structure of the PIARC Road Dictionary does not reflect the technical committee structure, because changes in the technical committee structure are more frequent than those in the organization of the Dictionary into chapters. Technical committees may report difficulty with the structure of the PIARC Road Dictionary when they wish to review the terms for a specific subject area. Nevertheless it is doubtful whether the adaptation of the Dictionary to the organization of the technical committees every four years would be more efficient.

In developing and updating the basic (English and French) versions of PIARC terminology, the opinions of representatives in CTERM were long divided between two alternatives:

- one is to create a definition for each term, like in most specialized dictionaries. This represents the view of those who believe that restricting the number of definitions in the PIARC Road Dictionary is incompatible with the development of a project as ambitious as PIARC terminology. Furthermore, to allow unequivocal translation into a target language, they consider that any term or expression must be unambiguous in the source language. To attain this objective in technical terminology, a definition is absolutely necessary;
- the other is to define only specific road terms (such as “ring-and-ball test”) not known to non-specialists, and general terms (such as “ageing”) that have a specific meaning in road technology. This option raises the problem of assessing what non-specialists may know or may not know, but has the advantage of avoiding “inflating” the PIARC Road Dictionary to a volume that would be too bulky for practical use and make translations of the Dictionary into other languages prohibitively costly in many countries.

The second alternative appears to have prevailed since the Durban Congress in 2003, but this choice may have to be reviewed in the light of the possibilities (including selection of terms for translations) currently held out by the on-line database.

Better use should be made of the possibilities of data processing to supplement the Dictionary with illustrations (see section 1.3.2.1 above).

2.5 PIARC and standardization (ISO and CEN)

English and French are the official languages for international standardization (ISO), and English, French and German are the official languages for European standardization (CEN). The updating of the PIARC Road Dictionary provides an opportunity for dissemination and use in ISO and CEN working groups.

Although feedback from these working groups in the form of internationally agreed terms and definitions is hampered by the fact that terminology work in ISO and CEN is usually limited to the context of a specific standard – whereas that in PIARC is more comprehensive in scope –, it would be useful to establish and maintain contacts with the various ISO and CEN working groups active in road and road-related fields. Members of PIARC technical committees who participate in ISO and CEN working groups should be

encouraged to report on ISO and CEN terminology work to the terminology correspondents in their committees. This would enable PIARC, ISO and CEN to harmonize their terminologies for the benefit of the international road community.

2.6 PIARC and TERMIUM Plus®

TERMIUM Plus® is a terminology and linguistic data bank containing terms, synonyms, acronyms, definitions, phraseology units, examples of usage and observations in a wide variety of fields such as administration, science and informatics. The Canadian Government has been developing the database for more than thirty years, constantly updating and improving it. The search facility is similar to that of the on-line PIARC Road Dictionary.

Since early in 2010, TERMIUM Plus® has been on the web for free public access. Mutual use of TERMIUM Plus® and PIARC terminology data (with acknowledgement) should have a “cross-fertilizing” effect.

2.7 Improving the on-line service

Statistics obtained through a Google account indicated that in 2012-2015 the number of visitors to the PIARC Terminology site ranged roughly between sixty and one hundred on weekdays and about twenty on weekends, although it is unclear how many of the visitors were CTERM members. The use of the site remained quite constant and the database was accessed most frequently from France, Belgium and Canada.

Next CTERM should consider how to improve the on-line service:

- CTERM's webmaster may be requested to extract more information from the available statistics, e.g. geographic origin and/or affiliations (universities, private companies, public bodies, etc.) of the visitors per page. It is, in fact, very important to know which languages are consulted in the PIARC Road Dictionary, in order to better assess the relevance of translations;
- for the future, PIARC could think about customized paper dictionaries to be printed by users (subject to terms and conditions yet to be specified), as well as about an application for smartphones and tablets.

2.8 Working environment

The arrangement for CTERM to work directly under the General Secretariat has worked well in 2012-2015, especially with Marie Pastol and Robin Sébille as liaising members. It is recommended that this arrangement be continued in future.

Attendance at meetings was hampered at times by the cost of travel and by national economic constraints. CTERM should continue to avoid long travel in future, e.g., meetings outside Europe. Though mainly suitable for short meetings of a few people, teleconferencing (Skype, WebEx) could be helpful to enhance the participation of corresponding members.

The Folders section of CTERM's workspace on the PIARC website, which was managed by Balázs Szirányi in 2012-2015, greatly facilitated the sharing of – especially bulky – documents. On the other hand, the Forum section was not used as e-mailing was felt to be more effective for the progress of work between meetings.

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**TECHNICAL COMMITTEE 1.1
PERFORMANCE OF
TRANSPORT ADMINISTRATIONS**

2012-2015 ACTIVITY REPORT

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COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

Agneta Wargsjo (Sweden)
Alan Colegate (Australia)
Alberto de Benito Lombardero (Spain)
Alexander Walcher (Austria)
Alice Mathew (South Africa)
Andras Gulyas (Hungary)
André Bernard (France)
Anne-Severine Poupeleer (Belgium)
Brendan Nugent (Australia)
Connie Yew (United States)
David Virden (United Kingdom)
Ilaria Coppa (Italy)
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Susumu Takamiya (Japan)
Sylvestre Kotchofa (Benin)

Other members contributed at specific time and their assistance was appreciated

Aidan McGann (Australia)
Eric Turcotte (Quebec, Canada)
Justin Runji (SSATP, World Bank)
Milan Hulej (Slovak Republic)
Matthew Steeves (Canada)
The World Bank associate members

1. THE TERMS OF REFERENCE, WORK PROGRAMMES AND ORGANISATION

Each working group prepared a working programme at the beginning of the cycle. The working programmes were based on the terms of reference provided by the World Road Association Executive through their strategic plan.

1.1 The Terms of reference

TC 1.1 – Performance of Transport Administrations

Issue 1.1.1 Evolution of structures and missions of the administrations	
<i>Strategies</i>	<i>Outputs</i>
Investigate the recent changes in road administrations (integration of transport modes, scope of responsibilities, nature and size of road network, increased stakeholder power and involvement, etc.). Analyse and understand the drivers for these changes, the challenges involved in their implementation, the expectations of those driving the change and identify the impacts.	Lessons learned and guidance report on changes within transport administrations.
Issue 1.1.2 Assessment of administrations' performance	
<i>Strategies</i>	<i>Outputs</i>
Investigate and compare how road or transport administrations assess and measure their overall performance and identify good practice in the development of performance frameworks and benchmarks.	Guidance report identifying benchmarks for transport administration performance.
Issue 1.1.3 Good governance and anti-corruption measures	
<i>Strategies</i>	<i>Outputs</i>
Understand and investigate current situations of and key issues affecting institutional integrity with a focus on anti-corruption measures in the road sector and identify the effective benchmarks of integrity laws, policies and measures, transferable lessons including implications of increased scrutiny by the media.	Guidance report on the key issues impacting upon institutional integrity including relevant case studies.

1.2 The Work Programmes

The programmes evolved based on the technical committee members initial meetings and were influenced by change of memberships within the working groups. All the working programmes have been approved by the World Road Association Executive after adjustment and feedback. The following tables summarise the work programme of each working group. The tables with orange headers are the original working programmes as approved by the World Road Association at the beginning of the cycle and the green header tables are the updated versions with our progress throughout the cycle.

1.2.1 TC Work Programmes

TC 1.1: Performance of Transport Administrations - ORIGINAL		
TC 1.1 Chair and Secretariat	Chair: Brendan NUGENT (Australia) English-speaking Secretary: Connie YEW (USA) French-speaking Secretary: André BERNARD (France) Spanish-speaking Secretary: Alberto DE BENITO (Spain)	
Description of the selected strategies	<ol style="list-style-type: none"> 1. Investigate recent changes in road administrations (e.g. missions and functions, integration of transport modes, scope of responsibilities, structural change, increased stakeholder power and involvement). 2. Investigate and compare how road or transport administrations assess and measure performance and identify best practice in the development of performance frameworks and benchmarks. 3. Understand and investigate current situations of and key issues affecting institutional integrity with a focus on anticorruption measures in the road sector and identify the effective benchmarks of integrity laws, policies and measures, transferable lessons including implications of increased scrutiny by the media. 	
Working group leaders	Jonathan Spear (UK) and Alex Walcher (Austria) Mara Campbell (USA) and Alan Colegate (Australia) Alice Mathew (South Africa) and Connie Yew (USA)	
Cooperation within PIARC	TC 1.2 Financing TC 1.4 Road Transport System Economics/Social Development TC 2.2 Improved Mobility in Urban Areas TC 1.5 Risk Management	
Cooperation with other organizations	Organization for Economic Cooperation and Development (OECD) World Bank Regional Development Banks (Asia/Africa/Latin America) UITP (International Association of Public Transport) Peak Transport and Research Organisations (e.g. Austroads, Nordic Road Association, CEDR and TRB) African Road Maintenance Funds Association (ARMFA) Global Reporting Initiative (GRI) Global Excellence Model (GEM) Council (e.g. Baldrige, EFQM, SPRING, ABEF) Organisation for Economic Cooperation and Development (OECD) Transparency International Anti-corruption Forum	
Outputs		Calendar
Technical reports	WG 1: International trends, governance and outcomes of multi-modal planning and decision making in the road and transport sector WG 2: A summary report based on case studies from 4-6 countries/states/regions that aims to ensure good practice and maturity in performance measurement. Investigate and compare performance frameworks WG 3: Case studies and updated Toolkit following determination of its practical application (following on from Routes/Roads articles) Guidance report on the key issues impacting (including influences from media/other interest groups) upon institutional integrity including relevant case studies.	Oct 2015
Articles	Seven articles during the cycle: <ol style="list-style-type: none"> 1. WG3 - Article 2 Seek feedback on practical application of Toolkit 2. WG1 - Article 1 Key Trends in the Transport Sector 3. WG2 - Article 1 Summary of case studies 4. WG2 - Article 2 Summary of the ARMFA Seminar 5. WG3 - Article 3 Update report on findings on practical application of the Toolkit, including proposed updates as appropriate 6. WG2 Article 3 Best practices in performance management frameworks 7. WG1 - Article 2 Case Studies of Multi-Modal Planning and Decision 	<ol style="list-style-type: none"> 1. Jul 2013 2. Aug 2013 3. Oct 2013 4. Feb 2014 5. Jan 2014 6. Feb 2015 7. May 2015

	Making	
PIARC international seminars	The TC plans on holding two seminars during the course of the cycle. Different WGs will lead specific aspects of the seminar but each group will have specific output relevant to their specific theme. 1. Africa jointly with ARMFA (WG2 lead) Efficiency of administrations and road maintenance Performance measures in place (trend, decision making, reporting etc) 2. South America (Chile, Argentina) Seminar to be held jointly with the TC 1.5 on Risk Management	October 2013 September 2014
Other Events	<ul style="list-style-type: none"> • Winter Road Congress Andorra – presentation to raise awareness of availability of Toolkit and seek feedback on its practical application • International Baltic Road Conference Lithuania - presentation to raise awareness of availability of Toolkit and seek feedback on its practical application - Alexander Walcher • IRF Conference Riyadh – presentation on work in progress and initial outputs on practical application of the Toolkit (presenter to be determined) • TRB International Performance Management Conference • As appropriate and as opportunities emerge 	Feb 2013 August 2013 November 2013 May 2014 Ongoing
Session at XXV World Road Congress		2-6 November 2015

1.2.2 Working Group 1 Work Programmes

Issue: 1.1.1: Evolution of missions and structure of road or transport administrations - ORIGINAL	
Description of the selected strategies	<p>Investigate recent changes in road administrations (e.g. missions and functions, integration of transport modes, scope of responsibilities, structural change, increased stakeholder power and involvement)</p> <p>Analyse and understand the drivers for these changes, the challenges involved in their implementation, the expectations of those driving the change and identify the impacts.</p> <ul style="list-style-type: none"> • The working group will focus on investigating and analysing the evolution of missions and structures of road or transport administrations. Missions may relate to the vision, purpose or other phrase that defines or captures what road or transport organisations are tasked with delivering. The working group has scope to: • Investigate recent and significant changes to the mission, function or structure of road or transport administrations, including shifts towards multi-modal planning and delivery, central planning and coordination and the formation of multi-modal transport agencies. This issue may be investigated on different geographical scales e.g. at the city-level, regional-level and national-level, for different functions and from a roads-focused and multimodal perspective. • Analyse the drivers for these changes, objectives, the challenges involved in their implementation, the outcomes of these changes where possible and whether undertaking multi-modal planning at one geographical level impacts on another e.g. are changes at the national-level followed at the regional or city-level. • Analyse the impacts of any changes, including whether improved efficiency or effectiveness can be achieved through the integration of transport modes and the optimum mechanisms of achieving this. • Support the analysis with suitable qualitative and quantitative evidence, including a questionnaire survey of WRA Members and collation of appropriate case studies.
Working group leader	Jonathan Spear (UK) and Alex Walcher (Austria)
Cooperation within PIARC	TC 1.2 Financing TC 1.4 Road Transport System Economics/Social Development TC 2.2 Improved Mobility in Urban Areas
Cooperation with other organizations	Organization for Economic Cooperation and Development (OECD) The International Association of Public Transport (UITP) The World Bank Regional Development Banks (Asia/Africa/Latin America)

Outputs		Calendar
Technical reports	Final report: International Trends, Governance and Outcomes of Multi-Modal Planning and Decision Making in Road and Transport Sector	Oct 2015
Articles	Two articles during the cycle Article 1 – Key Trends in the Transport Sector Article 2 – Case Studies of Multi-Modal Planning and Decision Making	Aug 2013 May 2015
PIARC international seminars	The TC plans on holding two seminars during the course of the cycle. Different WGs will lead specific aspects of the seminar but each group will have specific output relevant to their specific theme. 1. Africa jointly with ARMFA (WG2 lead) · Efficiency of administrations and road maintenance 2. South America (Chile, Argentina) · Seminar to be held jointly with the TC 1.5 on Risk Management	Oct 2013 Sep 2014
Session at XXV World Road Congress		2-6 November 2015

Issue 1.1.1: Evolution of missions and structure of road or transport administrations - ACHIEVED		
Description of the selected strategies	<ul style="list-style-type: none"> Investigate the recent changes in respect of multi-modal governance processes and structures within road and transport administrations. Analyse and understand the drivers for these changes, the challenges involved in their implementation, the expectations of those driving the change and identify the impacts. 	
Working group leaders	Jonathan Spear (UK) and Alex Walcher (Austria)	
Cooperation within WRA	TC 1.2 Financing TC 1.4 Road Transport System Economics/Social Development TC 2.2 Improved Mobility in Urban Areas	
Cooperation with other organizations	Organization for Economic Cooperation and Development (OECD) The International Association of Public Transport (UITP) The World Bank Regional Development Banks (Asia/Africa/Latin America)	
Outputs:		Calendar
1. Questionnaire survey of WRA members into their preparation of actions to address multi-modal integration;		1. Jun 2013
2. A range of in-depth Case Studies of organisations which have re-structured or adopted actions to achieve multi-modal planning and delivery;		2. Dec 2014
3. A Conceptual Model for Multi-Modal Transport which considers the key aspects of achieving integration, whether through structural reform or other mechanisms;		3. May 2014
4. Applications of the conceptual model, including a Toolkit for Multi-Modal Collaboration and Advice on Structural Re-Organisation;		4. Dec 2014
5. An overall analysis and set of recommendations arising from the above, both in terms of the current topic in hand and suggestions for further work in the next WRA Cycle 2016 - 2020; and		5. Jan 2015
6. Wider awareness of the key issues pertaining to multi-modalism from the ongoing work of the Technical Committee itself, technical seminars and activity planned in Seoul.		6. Mar 2015
Technical reports	A full technical report will be produced including results of a survey, case studies, and applications of a conceptual model to address multi-modal integration; This Report, and the concepts and products included in it, will be disseminated widely at and beyond Seoul and incorporated into work programmes developed for subsequent WRA cycles.	Jun 2015
Articles and papers	One article submitted during the cycle: · Key Multi-Modal Governance Trends in the Transport Sector: Survey Results (submitted but not published)	Oct 2013
WRA international seminars and workshops	<ul style="list-style-type: none"> Joint Seminar with ARMFA on Performance and Governance of Road and Transport Administrations in Arusha, Tanzania Workshops conducted in London, United Kingdom with Transport for London and the Department for Transport International Workshop conducted in Pretoria, South Africa with a focus on governance, asset management and a focus on Africa 	Sep 2013 May 2014 Dec 2014
Other events	<ul style="list-style-type: none"> International Baltic Road Conference Lithuania - presentation to raise awareness of availability of Toolkit and seek feedback on its 	Aug 2013

	practical application - Alexander Walcher · Transportation Research Board 5th Transportation Systems Performance Measures and Data Conference, Denver, Colorado	Jun 2015
Sessions at XXV World Road Congress	Seoul – November 2015 – Support for TC 1.1 Technical Session and Special Session	2-6 November 2015

1.2.3 Working Group 2 Work Programmes

Issue: 1.1.2: Performance of road or transport administrations - ORIGINAL		
Description of the selected strategies	<p>Investigate and compare how road or transport administrations assess and measure performance and identify best practice in the development of performance frameworks and benchmarks.</p> <p>The working group will focus on the performance of road or transport administrations, and agencies and key stakeholders that are directly involved with road or transport administrations where appropriate. The working group has scope to:</p> <p>Investigate and compare the planning and performance frameworks of member road or transport administrations, and how these frameworks and performance are aligned to the outcomes of the administration, Government and Customers (based on the Public Value Chain from the previous cycle). Identify best practice in the development of performance frameworks and benchmarks of member road or transport administrations.</p> <p>Examine types of performance assessment and measurement audience, including communication channels.</p>	
Working group leader	Mara Campbell (USA) and Alan Colegate (Australia)	
Cooperation within PIARC	It is the WG's belief that the deliverables from this WG can interface with all of the Strategic Themes. However, it is of note that this WG will be collaborating directly with TC 1.5 Risk Management only.	
Cooperation with other organizations	UITP (International Association of Public Transport) Peak Transport and Research Organisations (e.g. Austroads, Nordic Road Association, CEDR and TRB) African Road Maintenance Funds Association (ARMFA) Global Reporting Initiative (GRI) Global Excellence Model (GEM) Council (e.g. Baldrige, EFQM, SPRING, ABEF)	
Outputs		Calendar
Technical reports	A summary report based on case studies from 4-6 countries/states/regions that aims to ensure good practice and maturity in performance measurement. Investigate and compare performance frameworks.	Oct 2015
Articles	3 articles during the cycle Article 1: Summary of case studies Article 2: Summary of the ARMFA Seminar Article 3: Best practices in performance management frameworks	Oct 2013 Feb 2014 Feb 2015
Other events	TRB International Performance Management Conference	May 2014
Sessions at XXV World Road Congress		2-6 November 2015

Issue: 1.1.2: Performance of road or transport administrations - AGREED		
Description of the selected strategies	<ul style="list-style-type: none"> Investigate and compare how road or transport administrations assess and measure their overall performance and how these frameworks are aligned to the outcomes of the administration. Identify good practice in the development of performance frameworks and benchmarks. Examine types of performance assessment and measurement of audiences including communication channels. 	
Working group leader	Mara Campbell (USA) and Alan Colegate (Australia)	

Cooperation within WRA	There was not direct cooperation undertaken with any other Technical Committee – proposed joint seminar with TC1.5 to be held in South America did not eventuate.	
Cooperation with other organisations	Austroads Nordic Road Association AASHTO and the Transportation Research Board African Road Maintenance Funds Association (ARMFA) Association of Southern African National Roads Agencies (ASANRA) Transport for London	
Outputs:	<ul style="list-style-type: none"> • Guide to Good Practice on Performance Frameworks for road and transport administration. • Compendium of nine Case studies from a range of organisations at a local, provincial, district, state or national level. • Knowledge sharing articles prepare for publication in Routes/Roads magazine but not used. • Knowledge sharing article summarising the outcomes of the International Seminar on Performance and Governance of Road and Transport Administrations. 	Calendar Mar 2015 Mar 2015 Oct 2013 Feb 2014
Technical reports	A Guide based on case studies, literature searches and international seminars from nine jurisdictions including national and regional agencies that identifies good practice and maturity in performance measurement. This report does not seek to identify specific performance measures or indicators, instead what it seeks to do is to identify the framework and constructs that will measure the success of the approaches taken in developing a performance measurement framework and assist in communicating those results to the community. The guide to good practice is supported by a complementary document that incorporates the case studies along with an overarching comparator.	Jun 2015
Articles and papers	Two articles submitted over the cycle: Article 1: Exploring good practice in performance frameworks (submitted but not published) Article 2: Arusha Seminar Report – published	Feb 2013 Feb 2014
WRA international seminars and workshops	<ul style="list-style-type: none"> • Joint Seminar with ARMFA on Performance and Governance of Road and Transport Administrations in Arusha, Tanzania • Workshops conducted in London, United Kingdom with Transport for London and the Department for Transport • International Workshop conducted in Pretoria, South Africa with a focus on governance, asset management and a focus on Africa 	Sep 2013 May 2014 Dec 2014
Other events	Transportation Research Board 5th Transportation Systems Performance Measures and Data Conference, Denver, Colorado	Jun 2015
Sessions at XXV World Road Congress	Seoul – November 2015 – Support for TC 1.1 Technical Session and Special Session	2-6 November 2015

1.2.4 Working Group 3 Work Programmes

Issue: 1.1.3 Good governance and anti-corruption measures - ORIGINAL	
Description of the selected strategies	<p>Understand and investigate current situations of and key issues affecting institutional integrity with a focus on anticorruption measures in the road sector and identify the effective benchmarks of integrity laws, policies and measures, transferable lessons including implications of increased scrutiny by the media.</p> <p>The working group will continue the work of the previous WRA cycle that focussed on good governance and anti-corruption measures of road or transport administrations. The working group has scope to:</p> <p>Determine the adequacy of the WRA Integrity Toolkit in supporting road administrations and their supply chain in addressing key issues affecting institutional integrity.</p> <p>Determine to what extent institutional integrity reputation may be affected by perception: versus reality, including through influence from the media and others “interests/activity”. (Does public perception drive and support good governance).</p>

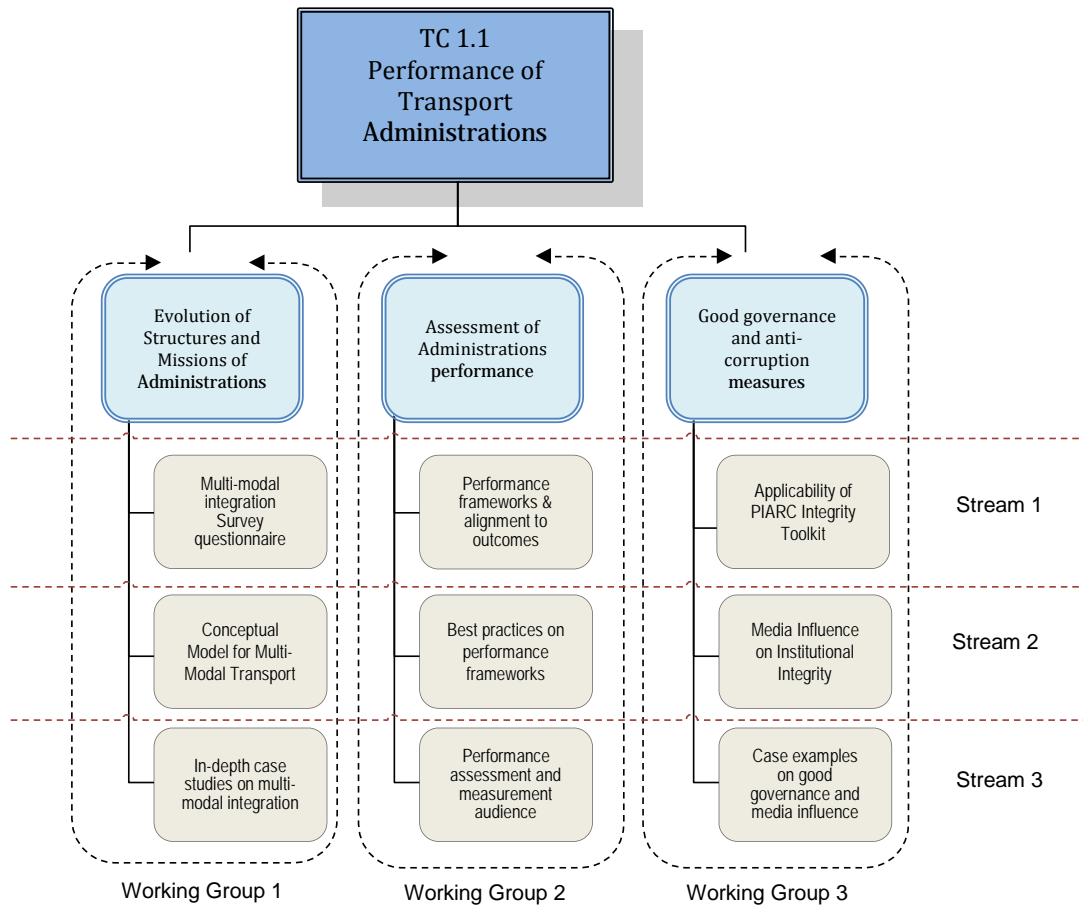
Working group leader	Alice Mathew (South Africa) and Connie Yew (USA)	
Cooperation within PIARC	TC 1.5.1 Risk Management (perception verses reality)	
Cooperation with other organizations	Organisation for Economic Cooperation and Development (OECD) – Working Group contact Michel DeMarre World Bank – Working Group contact Connie Yew (initial introduction by Michel) Transparency International – Working Group contact Alice Mathew UK Anti-Corruption Forum (www.anticorruptionforum.org.uk) – Working Group contact David Virden	
Outputs		Calendar
Technical reports	Case studies and updated Toolkit following determination of its practical application (following on from Routes/Roads articles) Guidance report on the key issues impacting (including influences from media/other interest groups) upon institutional integrity including relevant case studies.	Oct 2015
Articles	3 articles during the cycle Raise awareness of Toolkit (published Sept 2012) Seek feedback on the practical application of the Toolkit Update report on findings on practical application of the Toolkit, including proposed updates as appropriate	Jan 2013 Apr 2013 Jan 2014
PIARC international seminars	The TC plans on holding two seminars during the course of the cycle. Different WG will lead specific aspects of the seminar but each group will have specific output relevant to their specific theme. Africa jointly with ARMFA (WG2 lead) Efficiency of administrations and road maintenance TC 1.1.3: raise awareness of Toolkit and provide update on the practical application South America (Chile, Argentina) Seminar to be held jointly with the TC 1.5 on Risk Management TC 1.1.3: a) provide update on practical application of the Toolkit b) provide an update on the perception verses reality study	Oct 2013 Sep 2014
Other events	Winter Road Congress Andorra – presentation to raise awareness of availability of Toolkit and seek feedback on its practical application - David Virden International Baltic Road Conference Lithuania - presentation to raise awareness of availability of Toolkit and seek feedback on its practical application - Alexander Walcher IRF Conference Riyadh – presentation on work in progress and initial outputs on practical application of the Toolkit (presenter to be determined)	Feb 2013 Aug 2013 Nov 2013
Sessions at XXV World Road Congress		2-6 November 2015

Issue: 1.1.3 Good governance and anti-corruption measures - ACHIEVED	
Description of the selected strategies	<ul style="list-style-type: none"> Understand and investigate current situations of and key issues affecting institutional integrity with a focus on anti-corruption measures in the road sector. Identify the effective benchmarks of integrity laws, policies and measures, transferable lessons including implications of increased scrutiny by the media.
Working group leader	Alice Mathew (South Africa) and Connie Yew (USA)
Cooperation within WRA	TC 1.5 Risk Management
Cooperation with other organizations	Organisation for Economic Cooperation and Development (OECD) International Federation of Consulting Engineers (FIDIC) Confederation of International Contractors' Associations (CICA) China International Contractors Association (CHINCA) The World Bank UK Anti-Corruption Forum (www.anticorruptionforum.org.uk)

Outputs: 1. An overview of the Integrity Toolkit and survey results on the applicability of the Toolkit, 2. A discussion on the influence of media on institutional integrity, and 3. Case studies documenting good governance and anti-corruption measures and tools from other countries including influence of media.		Calendar Dec 2014 Jan 2015 Mar 2015
Technical reports	This report includes: (1) a discussion on the influence of media on institutional integrity, (2) an overview of the Integrity Toolkit and survey results on applicability of the Toolkit, and (3) case studies documenting good governance and anti-corruption measures and tools from other countries including influence of media.	Jun 2015
Articles and papers	Two articles during the cycle: Article 1 - A case study on Managing Risks on the Road to Recovery (submitted for July 2015 publication in Routes/Roads) Article 2 - Pretoria Workshop article (submitted but not published)	Dec 2014 Feb 2015
WRA international seminars and workshops	<ul style="list-style-type: none"> • Joint Seminar with ARMFA on Performance and Governance of Road and Transport Administrations in Arusha, Tanzania • Workshops conducted in London, United Kingdom with Transport for London and the Department for Transport • International Workshop conducted in Pretoria, South Africa with a focus on governance, asset management and a focus on Africa 	Sep 2013 May 2014 Dec 2014
Other events	<ul style="list-style-type: none"> • IRF Conference Riyadh – presentation on work in progress and initial outputs on practical application of the Toolkit • Durban Technical Committee on Rural Roads • SECA Board Meeting at RIA • Transportation Research Board 5th Transportation Systems Performance Measures and Data Conference, Denver, Colorado 	Nov 2013 Nov 2013 Dec 2013 Jun 2015
Sessions at XXV World Road Congress	Seoul – November 2015 – Support for TC 1.1 Technical Session and Special Session	2-6 November 2015

1.3 The Organisation

In order to deliver the expected outcomes, the technical committee 1.1 was divided in working groups who worked on streams as shown on the below chart.



2. PRODUCTIONS

2.1 Articles in Routes/Roads

The technical committee has submitted articles on the following topics:

- Seminar report for Arusha, Tanzania
- Workshop report for Pretoria, South Africa
- *Managing Risk on the Road to Recovery - Good Governance Strategies for Implementing the American Recovery and Reinvestment Act*

2.2 WRA International Seminars and Workshops

- Performance and Governance of Road and Transport Administrations, Arusha, Tanzania 24-26 September 2013
- Workshops conducted in London, United Kingdom with Transport for London and the Department for Transport May 2014
- International Workshop conducted in Pretoria, South Africa in December 2014 with a focus on governance, asset management and a focus on Africa

2.3 Related International Events

Participation at the following related conferences and meetings:

- Baltic Road Conference in Vilnius, Lithuania August 2013
- IRF World Meeting and Exhibition in Riyadh, Saudi Arabia November 2013
- WRA TC on Rural Roads Maintenance in Durban November 2013
- SECA Board Meeting at RIA December 2013
- Transportation Research Board 5th Transportation Systems Performance Measures and Data Conference. Denver, Colorado June 2015

2.4 Technical Committee Reports (all expected to be published in 2015)

- Evolution of the mission and structure of transport administrations - Trends and outcomes of multi-modal governance in the road and transport Sector
- Guide to good practice Performance Frameworks of Road and Transport Administrations
- Good Governance and Anti-Corruption Measures

2.5 Surveys

- 'Multimodal Integration'

From: TC 1.1.1 Evolution of missions and structure of road or transport administrations

Content: Questionnaire survey of WRA members into their preparation of actions to address multimodal integration

Timeline: Survey developed and circulated in 2013

Results: Survey was distributed to all WRA members and the results will be incorporated into the final report

- 'Application of Institutional Integrity Toolkit'

From: TC 1.1.3, Good Governance and Anti-Corruption Measures

Content: Questionnaire survey of WRA members to assess the applicability of the integrity Toolkit and whether or not the measures presented in the Toolkit are shared by the whole supply chain involved in road construction, maintenance, and operation activities.

Timeline: Survey developed and circulated in 2013
 Results: Survey was distributed to all WRA members and the results will be included in the final report

2.6 Other Initiatives

- One of the key successes of the Arusha seminar was to dramatically raise awareness of the WRA Integrity Toolkit through the findings/outputs of the conference and partnering with AMFRA in arranging Ministerial attendance from across the region highlighting the interest in anti-corruption in road investment.
- A joint initiative on project preparation between the World Road Association, International Federation of Consulting Engineers (FIDIC) and the Confederation of International Contractors' Associations (CICA) with the support of the World Bank and China International Contractors Association (CHINCA).

2.7 TC Meetings

The technical committee 1.1 met on several occasions during the cycle 2012-2015:

Paris, France	March 2012	
Sydney, Australia	September 2012	
Vienna, Austria	May 2013	
Arusha, Tanzania	September 2013	(Joint Regional Seminar with ARMFA)
London, UK	April 2014	(National workshops)
Pretoria, South Africa	December 2014	(International workshop)
Denver, Colorado, USA	June 2015	(Joint TRB International Conference)
Seoul, Korea	November 2015	

The minutes of these meetings can be seen on the World Road Association members' area website.

**TECHNICAL COMMITTEE 1.2
FINANCING OF ROAD SYSTEM**

ACTIVITY REPORT

MAIN ACTIVITIES OF TC 1.2 SUMMARY

Main activities of TC 1.2 Finning have focused in both TC meeting and Seminars. All seminars had been organized with the occasion of a TC meeting. The idea inspiring those seminars has been to spread as possible discussions and knowledge gathered by TC member and also obtaining additional information to be considered in our Technical report.

Besides, activities have taken place in the most broad geographical scenario possible, covering 4 continents (both Americas, Europe and Asia), and adjusting to the initial idea of having 2 meetings a year (spring and fall). The Committee feels very satisfied having fulfilled this objectives.

Also some contributions have been made to routes and roads magazine thanks to certain committee members.

TC 1.2 MEETINGS

As said before, there has been 2 meetings held by year. Those have been:

- Paris – March 2012 Paris - 31 members
- Rome – October 2012 - 29 members
- Montreal – March 2013 - 19 members + 5 others (*)
- New Delhi – November 2013 – 11 members + 7 locals (*)
- Santiago de Chile (together with LARWG*) - July 2014 - 11 members + some locals.
(*)
- Madrid – February 2015 – 16 members + STC + PIARC
- Tehran (Iran) – June 2015 – 10 members + some locals. (**)

(*) Meeting held together with an international seminar.

(**) A local seminar on PPP's took place.

Paris

During the first TC meeting it was agreed the creation of 2 subgroups each one devoted to each of the Issues of the Terms of reference. Also a list of outputs for the coming years. It was also proposed to have 3 international seminars, during the period.

Also different people were selected for the necessary posts within the committee. It was agreed that no Vice President was needed.

Rome.

With the occasion of the second TC meeting some changes on the committee structure were agreed. The questionnaires to obtain the necessary information on funding strategies were developed. Also a draft questionnaire for financing was presented.

An approach to Latin American Regional Group was also made.

* Latin American Regional Working Group

Montreal.

Both sub-groups had discussed increasing the number of responses to questionnaires.

All committee members were reminded to complete both questionnaires and to work with any relevant regional organizations they may be a part of to get responses from other organisations and countries.

It was also agreed that all questionnaires received could be placed on our shared PIARC workspace as a way to comment and develop our thinking between each committee meeting. An approach to Latin American Regional Group was also made.

New Delhi.

*Some discussions with IRC (Indian Road Congress) were held.
It was still needed to increase the number of responses to questionnaires.*

Mrs. Molina, president of the Latin America Regional Working Group, took the floor and commented developments to the TC.

Santiago.

A first draft report, « Funding and financing of road infrastructure beyond the global financial crisis » was circulated.

It followed the two issues of the Terms of reference, namely funding strategies and Financing.

Specific comments and suggested changes were made.

When PIARC's current Strategic Plan was prepared in 2008, the GFC (Global Funding Crisis) was a subject of great importance but the situation has changed since. Wanting to respect the Strategic Plan all while reflecting current conditions, the TC 1.2 report will address lessons can be learned from the GFC.

Madrid.

With the presence of both ST Coordinator and Mr. KO, from PIARC, the 6th meeting mainly focused on pendant tasks.

It was agreed that only one TC report will be produced for this cycle, and the title of this report will be "Funding and financing of road infrastructure beyond the global financial crisis".

The Committee agreed with the contents of this draft of Special session on 4th November (Seoul).

*The review of full papers, 23 abstracts and 20 papers was allocated.
Feedback for 2016/2019 Strategic Plan was given, providing a list of comments to the SP.*

Tehran.

Last, but not least, meeting took place in Tehran, with the idea of finalizing all the tasks, especially technical report.

The committee spent the first day and the second part of the second day in finalizing the Technical report. Taking advantage on the papers submitted by TC members, and the discussions made during the meeting, a good progress was made.

A summary of conclusions was made which, after discussions, will be included in the report.

It was agreed that the proposed agenda for Seoul Congress, with the proposed 4 papers to be presented is fine.

TC 1.2 INTERNATIONAL SEMINARS

As said before, 3 IS were held together with TC meetings.

1. *First international Seminar associated to TC 1.2 Took place in Montréal, Québec, Canada on March, 13th 2013. It was a **Seminar for a creative approach to financing major transport projects**. And it was organized by :*

- *AQTr's Board of Experts on Alternative Methods of Financing and Contracting,*
- *the Association québécoise des transports (AQTr), and*
- *the Ministry of Transport, Govt of Québec.*

The goal of the seminar, was to share what has been learned from innovative projects where new approaches were developed, making use of alternative ways of financing and implementing infrastructure projects.

The seminar was very well attended with 109 participants: 19 members from TC A 1.2 plus 90 local attendants.

Main presentations were:

- *The benefits and challenges of project financing*
- *The impact of the 2008 financial crisis on public-private partnerships: lessons learned by the North-American private sector*
- *The financing of roads and toll stations: The Japanese experience*
- *Public-private partnerships: before and after the 2008 crisis*
- *Congestion pricing: both a demand management tool and a source of financing*
- *The importance of funding to address public transportation challenges*
- *Paris Left Bank: from a territory of railway and industrial activities to urban districts*
- *Innovative financing for New York City's no. 7 subway extension*
- *Financing London's Crossrail network: a developer's point of view*
- *The "Transport/Development" integrated approach of the Bureau de projet sur les prolongements du métro du Montréal métropolitain: from planning to financing?*

2. *The second International Seminar associated to TC 1.2 Took place in New Delhi, India, November, 11-12th 2013. It was titled "**Experience Gained in PPP Projects in Road Sector – The Way Forward**" and was co-organized by:*

- *the Ministry of Road Transport and Highways, Govt. of India*
- *the Ministry of Ecology, Sustainable Development and Energy of France, Govt. of France*
- *the Indian Roads Congress, (IRC) and*
- *the World Road Association, (PIARC).*

This Seminar was a complete success, and we have the honor to count on with the presence of the Indian Minister of Public Works, and other authorities. Also the former chairman of TC 1.2 Mr. Henri Chua joined us.

The main topics analyzed were:

- *Overview in developing and managing road infrastructure in India and other countries.*
- *Overview of PPP Policy Framework worldwide.*
- *Experience in contractual model choices: analysis, risk allocation, government support mechanisms.*
- *Experience sharing in tendering for road infrastructure contracts & pre-construction activities.*
- *Legal aspects for road infrastructure projects, including Contract Management aspects.*
- *Panel discussion recap on key strategies for Way Forward for PPP road projects.*

3. *The third International Seminar associated to TC 1.2 Took place in Santiago, Chile, November, 7-8th July 2014. It was titled “**International Seminar in Road Financing**” and was co-organized by:*
- *the Ministry of Public Works of Chile,*
 - *the Association of Civil Engineers from Chile,*
 - *the Chilean Road and Transport Association, and*
 - *the World Road Association, (PIARC).*

The main topics of discussion were:

- *Diagnosis on Public Private investment model.*
- *How to improve road financing.*
- *Road maintenance and operation financing: Service standards.*
- *Road financing Challenges 2030.*
- *Private financing Experiences.*

The seminar was a success, and counted on with some 100 attendants.

TC 1.2 ROUTES AND ROADS CONTRIBUTION

An article called “freight transport” was provided. (Mr. Schwarz-Herda)

TC 1.2 TECHNICAL VISITS

With the occasion of TC meeting some technical visits were made. Respectively;

- **25 toll road** (Montreal). Visit to the operations. Also recently completed A30 toll road and the Champlain Bridge, (likely to be the biggest PPP project for Canada to date).
- **Airport axis toll road** (Madrid). Awarded European most safe tunnel. Also the control center of the motorway was visited.
- **Tehran-Pardis city toll road** (Tehran). An interesting project of urban development together with a toll road.

TC 1.2 MOST ACTIVE MEMBERS

Apart from other members, most active people during the cycle have been:

Gerardo GAVILANES (Spain), Anne PLUVINAGE-NIERENGARTEN (France), Volker RUX (Austria), Paloma ALONSO (Spain), Christian NAGL (Austria), Friedrich SCHWARZHERDA (Austria), Richard DESLAURIERS (Canada), István KÖVESDI (Hungary), Rafael ALDRETE (Mexico), Takaaki NAMBU (Japan), Fabio PASQUALI (Italy), Norbert ULRICH (Germany), Haydee LORDI (Argentina), Karen MOLINA (Nicaragua), Chantal GIROUARD (Canada-Québec), Nobuyuki KITANI (Japan), Alenka KOSIC (Slovenia), Chadi KHALED (France), Rik JOOSTEN (France), Daniel TOUTANT (Canada-Québec), Yasuyuki MATSUMOTO (Japan), William KOMENAN(Cameroon), Meghdad RAHIMIAN (Iran), and Manfred ZBINDEN (Switzerland).

**TECHNICAL COMMITTEE 1.3
CLIMATE CHANGE AND SUSTAINABILITY**

2012-2015 ACTIVITY REPORT

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COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

Chair : Simon Price , UK

Working Group 1

April Marchese, USA
Ferhat Hammoum, France
Felix Huber, Germany
Dora Hunyadi, Hungary
Beata Krieger, Germany
Markus Auerbach, Germany
Cristina Maruntu, Romania
Helen Murphy, Australia
Sarah Reeves, United Kingdom

Working Group 2

Norma Fernandez-Buces, Mexico
Karmen Fifer-Bizjak, Slovenia
Katsunori Kadoyu, Japan
Young-in Kwon, South Korea
Mogale Mphahlele, South Africa
Haji Sufian Zulakmal Bin, Malaysia

Working Group 3

Christine Deneuvillers, France
Guilherme Gissinger Teles Ribeiro, Portugal
Ijaz Mohammad Khan, Pakistan
Juan Fernando Mendoza Sanchez, Mexico
Samsi Gunarta, Indonesia
Martin Pöcheim, Austria
Viktoria Reiss-Enz, Austria
Tina Törnquist, Sweden

1. FOREWORD

Climate change is one of the most serious threats facing the world today. There is compelling scientific evidence that the global climate is changing and that the primary cause is the release of greenhouse gases resulting from human activity.

For transport, climate change brings the twin challenges of firstly understanding that the strong reliance on fossil fuelled transport systems is a key component of anthropogenic greenhouse gas emissions, and secondly recognising that transport solutions will need to be responsive to previously unforeseen climate conditions.

In addition Climate change is also part of a wider sustainability consideration with which transport authorities must increasingly engage, working towards the goal of making more sustainable decisions.

Technical Committee 1.3 Climate Change and Sustainability (TC1.3) has been tasked with analysing aspects of the challenges posed by climate change and sustainability at both a local and international level. Over the last cycle, the group has drawn upon a global network of transport and environmental experts to understand the effect of climate change on our transport and infrastructure, and to prepare for a future where mitigation and adaptation will be, increasingly, an international priority. In parallel the committee has also reviewed approaches to support more sustainable decision making.

2. WORK PROGRAMME AND ORGANISATION

The committee was organised into three working groups, each addressing a specific issue, as determined by the strategic plan. TC1.3.1 was tasked with examining 'Transport strategies regarding climate change mitigation and adaptation, TC1.3.2 with the 'Tools for understanding climate change mitigation' and TC1.3.3 addressed the 'Appraisal of sustainability of transport infrastructure plans'. All three groups were required to output a state-of-the-art report with recommendations on the development of successful strategies.

Each group developed a work plan. Common to the approach of each working group was an initial data gathering and survey phase. This was followed by a more in depth follow up to the initial survey results, plus the gathering of case study material. During the course of the committee's cycle, representatives of the working groups shared their preliminary findings with the wider committee, in order to promote the further exchange of ideas. All members of the working groups would like to express their gratitude to those individuals involved in the surveys and case studies.

3. THE PRODUCTIONS

Local Focus

An important part of the committee's activities has been to engage with a wider audience through meetings and conferences. Where these opportunities have arisen in each host country, presentations were delivered by the host to inform the committee of particular local circumstances with respect to the committee's activities.

The kick-off meeting was in Paris, in March 2012 at the head office of PIARC. The Chair provided an overview of the preceding committee – TCA.1 Preserving the Environment, and the implications for the 2012-2015 cycle. The committee discussed Terms of Reference, scope and Work Program.

In Stockholm in October 2012, the Chair introduced several speakers who discussed transport, sustainability and climate change policies in their respective jurisdictions. These included Mr Lars Nilsson of the Swedish Transport Administration, who covered the amalgamation of responsibility for the various transport modes in Sweden, the goals of the administration and the key challenges with respect to transport and the environment and Mr Håkan Johansson of the Swedish Transport Administration, who presented on the strategic priorities of the administration, its activities and reporting obligations. Håkan also discussed the goal of fossil fuel independence by 2030 and medium/long term effects of pursuing deep cuts in emissions.

In Ljubljana, April 2013, TC1.3 was welcomed by Ms Karmen Fifer-Bizjak (TC1.3 member and host) and Mr Bine Pingal (National Secretary of the Slovenian WRA National Committee). Bine presented an overview of the work and responsibilities of the Slovenian Roads Agency, highlighting the priorities of drivability, safety, mode accessibility, impact on the environment and regional and economic development. Karmen presented an outline of the Slovenian National Building and Civil Engineering Institute, including its role, funding and key projects.

In Seoul, October 2013, the local speaker was Chang Kyun Kim, CEO of Happy Transport Institute, who presented on transport in Korea titled “Transportation Practices in South Korea Focusing on Seoul”. The technical tour arranged to visit Korea Expressway Corporation, Incheon Bridge and Cheonggye-cheon restoration, as shown below.



Memorial photo before technical tour



Korea Expressway Corporation



Incheon Bridge



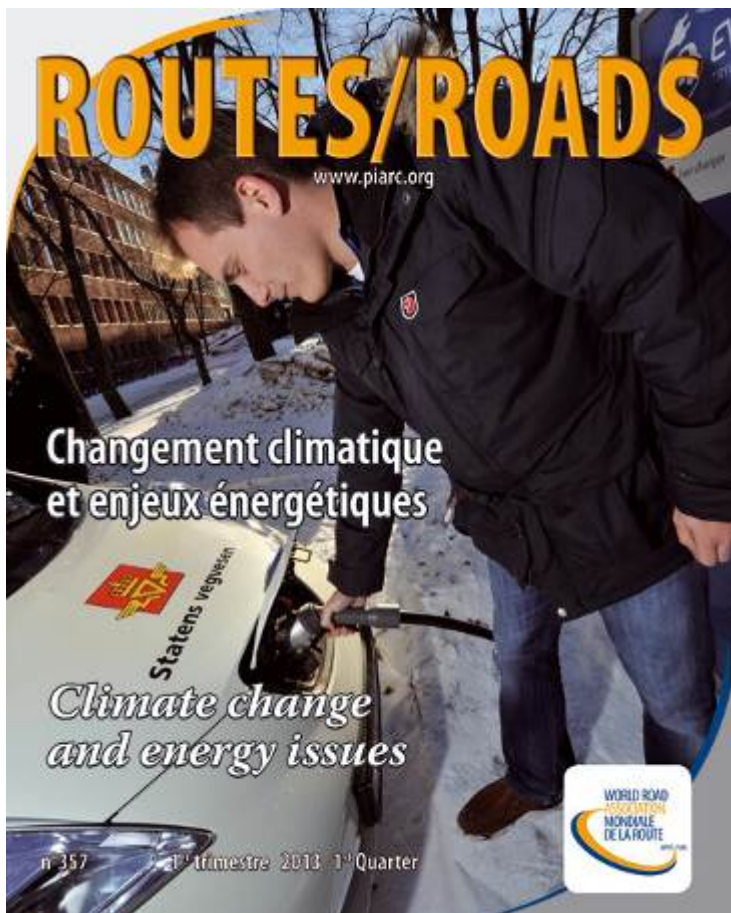
Cheonggye-cheon restoration before & after in 2004

In Bali, April 2014, Agah Mulyadi presented on research undertaken to investigate motorcycle greenhouse emissions due to the growth in sales commensurate with the population growth; current sales of motorcycles was indicated to be around 8 million units per year. The research identified a strong correlation between manufacturer, engine size, speed and CO2 emissions..

In London in 2014 a presentation was received on the progress with the PIARC special project related to the development of a climate adaption framework . For this presentation the committee was joined by two representatives of the UK National Committee, Andrew Boyle (Chair) and Justin Ward (Secretary). Committee members provided a number of steering points to the consultants undertaking the work.

The final meeting of the committee was held in Bucharest in May 2015.

Routes / Roads



Routes Roads N°357 – Climate Change and Energy Issues

A special edition of Routes / Roads magazine was published in January 2013 featuring an introductory article by Simon Price. Discussed in the introduction were a series of commissioned articles from across the globe, critically exposed the complexity of responding to the two climate changes commonly summarised as climate mitigation and climate adaption.

These papers included

- Dulac and Cuenot who presented an analysis of future scenarios in global traffic growth.
- Evans and Davis et al, who provided an example of the exploration of the options for carbon for carbon reduction in the transport sector in a developed economy at the national level.
- Huber and Falk argued that we need to consider new options for mobility and transport infrastructure in a post fossil fuel society.
- Leurent and Windisch addressed changing vehicle technology, discussing the considerations relating to the introduction of electric vehicles.
- Norbech provided a national case study of the implementation of electric vehicle strategy through an approach of fiscal incentives and public/private partnership.
- The papers of Ennesser and Fadeuilhe and, Leviakangas, both considered how the risks which climate change poses to infrastructure might be managed.

International Seminar

In April 2014, the committee supported an international seminar, “Road Sustainability & Green Technology”, in Bali, Indonesia. At this seminar papers were presented reflecting both the committee’s activities, and drawing on the particular experiences of the committee members.

TC1.3 members outlined the work of the committee in looking at the issues of climate change, carbon accounting and sustainability appraisal. These presentations and the subsequent discussion demonstrated the need, in each of these areas, for clear direction and exposition of best practice relevant to needs of different countries. Session 3, Report on PIARC activities, was chaired by Simon Price and featured talks from Helen Murphy, Katsunori Kadoyu, and Fernando Mendoza Sanchez discussing the issues raised by each of their respective working groups.

Photos of the event are included below.



Special Projects

In this cycle PIARC conceived a new initiative to undertake 'special projects'; an initiative which TC 1.3 was extremely keen to support.

An initial brief was prepared, which has subsequently been let to a consultant under the title 'An International Framework for Climate Change Adaptation'.

The framework will guide road agencies through a series of steps to identify potential impacts of climate change on their networks, identify the level of potential risk and vulnerability, understand how to respond to these risks effectively, and direct them towards appropriate and useful resources, evidence and supporting information.

The project is now underway with members of the technical committee guiding the project through a steering committee

**TECHNICAL COMMITTEE 1.4
ROAD TRANSPORT SYSTEM ECONOMICS
AND SOCIAL DEVELOPMENT**

2012-2015 ACTIVITY REPORT

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COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

Fred AMONYA	United Kingdom
William ASIGAU	Papua New Guinea
Ayman BAKI	United States of America
Anis BALAFREJ	Morocco
Manon BARIL	Canada
Jan-André BÜHNE	Germany
Dominique BUGAREL	France
Namgeon CHO	South Korea
Laurent DONATO	Belgium
Elna FOURIE	South Africa
Thomas GRÜNSTÄUDL	Austria
Karl-Josef HÖHNSCHEID	Germany
Petri JUSI	Finland
Jonghak KIM	South Korea
Anne KJERKREIT	Norway
Yongseok KO	South Korea
Tomaz KOSIC	Slovenia
Anatole KOUZONDE	Benin
Haydee Alicia LORDI	Argentina
Habou Soufiane MAGAGI	Niger
Gijs MOORS	Belgium
Peo NORDLÖF	Sweden
Renee OKALA	Cameroon
Martin PITONAK	Slovakia
Christof REHLING	Austria
Maurizio ROTONDO	Italy
Malika SEDDI	France
Hirotaaka SEKIYA	Japan
Egidijus SKRODENIS	Lithuania
Vratislav SKVOR	Czech Republic
Thoru TAMURA	Japan
Barnabé TANG AHANDA	Cameroon
Feng TIAN	China
Guillermo TORRES VARGAS	Mexico
Aivaras VILKELIS	Lithuania
Karen WHITE	United States of America
<u>Guests:</u>	
Désiré AVOM	Cameroon
T. CHEMANGANG	Cameroon
Harry T. DIMITRIOU	United Kingdom
Oh DONGKYU	South Korea
Jay JAYASUNDARA	United Kingdom
Kangsoo KIM	South Korea
Thomas KRANZ	Germany
Valerie ONGOLO	Cameroon
Jean-Marc PHILIPPEAU	PIARC
Changjun SONG	South Korea
Gustave SONON	Benin
Insoo YEO	South Korea

1. WORK PROGRAMME AND ORGANISATION

1.1 SCOPE OF WORK

Investments in roads can create substantial social and economic benefits and improvements to quality of life. Incorporating these benefits into the appraisal process is of great assistance to decision-makers in setting priorities for limited available resources. TC 1.4 investigated new developments in the appraisal of economic and social aspects in decision-making methodologies for transport projects.

The a priori-evaluation of road investments has a long tradition. In the shade of this established practice the ex post-evaluation is not as often carried out. Therefore, TC 1.4 studied methods of post-project evaluations.

1.2 TC-STRUCTURE

Chair: Karl-Josef HÖHNSCHEID (Germany)

English-speaking Secretary: Fred AMONYA (United Kingdom)

French-speaking Secretary: Manon BARIL (Canada) later replaced by Renée OKALA (Cameroon)

Spanish-speaking Secretary: Guillermo TORRES VARGAS (Mexico)

The work programme of the TC is divided into 2 working groups:

- WG 1.4.1 Appraisal of economic and social decision-making (focus on new developments)
- WG 1.4.2 Post project monitoring and long term evaluation of transport infrastructure projects

An ad hoc WG group was established for an issue of the Routes/Roads magazine dedicated to ex ante-evaluation. The ad hoc- WG was terminated after Routes/Roads issue 356 was published.

Further organizational arrangements were fixed at the beginning of the PIARC-cycle:

Vice –chair Egidijus SKRODENIS (Lithuania)

WG 1 Leader Haydee Alicia LORDI (Argentina)

WG 2 Leader Egidijus SKRODENIS (Lithuania)

WG 1 Secretary Renee OKALA (Cameroon)

WG 2 Secretary Anne KJERKREIT (Norway)

Webmaster Elna FOURIE (South Africa)

Liaison with Terminology Committee Manon BARIL (Canada), later replaced by Laurent DONATO (Belgium)

Liaison with TRB Ayman BAKI (United States of America)

Liaison with PIARC TC 1.1 Elna FOURIE (South Africa) and Haydee Alicia LORDI (Argentina)

Liaison with PIARC TC 1.2 Maurizio ROTONDO (Italy) and Laurent DONATO (Belgium)

Liaison with PIARC TC 1.3 William ASIGAU (Papua-New Guinea), Guillermo Torres VARGAS (Mexico), Haydee Alicia LORDI (Argentina) and Dominique BUGAREL (France)
Liaison with PIARC TC 1.5 Hirotaka SEKIYA (Japan) and Thomas GRÜNSTÄUDL (Austria)
Ad hoc leader for seminar groups Fred AMONYA United Kingdom
Ad hoc leader for routes/roads issues Karl Josef HÖHNSCHEID Germany

1.3 TC Meetings

TC 1.4 held six meetings between 2012 and 2014:

1st Meeting – Paris, France - March 7th and 8th, 2012

2nd Meeting – London, United Kingdom, October 29th and 30th, 2012. The meeting was hosted by the CIHT.

3rd Meeting – Bergisch Gladbach, Germany - March 19th and 20th, 2013. The meeting was hosted by the Bundesanstalt für Straßenwesen/Federal Highway Research Institute (BASt).

4th Meeting – Yaounde, Cameroon - November 13th to 16th, 2013. The meeting was hosted by the Ministère des Travaux Publics of Cameroon. The meeting was combined with a PIARC-conference about Economic Aspects of Road Networks and Social Development.

5th Meeting – Seoul, South Korea - March 25th to 27th, 2014. The meeting was co-hosted by PIARC Korean National Committee and Korean Research Institute for Human Settlements (KRIHS).

6th Meeting – Buenos Aires, Argentina - November 5th and 6th, 2014. The meeting was connected with the Pre-Congress of the Argentine Roads Association.

2. PRODUCTIONS

2.1 REPORTS AND PRESENTATIONS AT TC MEETINGS

Fred AMONYA, United Kingdom, The search for the transmission mechanism of transport effects as a major challenge of Cost-Benefit Analysis

Jan-Andre BÜHNE, Germany, Road Transport Planning Process in Germany

Namgeon CHO, South Korea, Ex-Post Evaluation System of Road Project in Korea

Namgeon CHO, South Korea, Case study of an ex-post evaluation on a motorway in Korea

Elna FOURIE, South Africa, Selection of community development projects on social and human elements

Thomas GRÜNSTÄUDL, Austria, Feasibility study: Beneficial effects of traffic infrastructure on the basis of a junction (originally presented by Georg Hauger et al, Technical University Vienna)

Thomas GRÜNSTÄUDL, Austria, S 8 - regional effects in phases of construction & operation (results of a study by the Institute for Advanced Studies, Vienna)

Karl-Josef HÖHNSCHEID, Germany, Economic studies on the Italian and Austrian motorway networks

Jong-Hak KIM, South Korea, The effects of expressway networks in Korea (1970-2010)

Anne KJERKREIT, Norway, Lessons from ex-post cost- benefit analyses of road projects in Norway

Anne KJERKREIT, Norway, New methodology for CBA of investments to prevent avalanches/land slides

Anne KJERKREIT, Norway, Norwegian Experience in ex-post project evaluation

Anatole KOUZONDE, Impact of road 's investment on the economical growing, study of Benin

Haydee Alicia LORDI, Argentina, Study and analysis of the economic benefits of a rehabilitation and conservation plan for rural roads – strategic plan for the rural roads in the province of Jujuy

Habou Soufiane MAGAGI, Niger, Overview about recent problems with the road infrastructure conditions in several Western African countries with two case studies from Burkina Faso and Côte d'Ivoire

Peo NORDLÖF, Sweden, Economics and Models - Market and Planning

Peo NORDLÖF, Sweden, New developments in Swedish assessment techniques and the new Swedish "Summary Table of Impacts (SEB)"

Peo NORDLÖF, Sweden, Summary of the Swedish debate on the discount rate

Peo NORDLÖF, Sweden, The Swedish winter model

Renee OKALA, Cameroon, Results of a study on the assessment of infrastructure investments (carried out by Dr Tang)

Christof REHLING, Austria, Dynamic aspects of investment planning and project evaluation (originally presented by Georg Hauger et al, Technical University Vienna)

Maurizio ROTONDO, Italy, Effect of motorway connections on Italian towns - an empirical analysis

Hirota SEKIYA, Japan, A new scheme for evaluating road projects by considering their effects after disasters

Hirota SEKIYA, Japan, Experiences from Japan with ex-post evaluation

Barnabas TANG AHANDA, Cameroon, Presentation of the Cameroonian road network as well as an economic analysis model developed at the Department of Public Works for the estimation of the impact of road works on economic growth

Guillermo TORRES VARGAS, Mexico, Role of interest rates on infrastructure assessments - some Mexican cases

Guillermo TORRES VARGAS, Mexico, Travel time value as an input into cost-benefit analysis of investment projects of road infrastructure - the case of Mexico

Karen WHITE, USA, Ex-ante evaluation of national highway investment needs and introduction of the conditions and performance report

Karen WHITE, USA, 2013 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report to Congress, Overview & Key Highway Findings

2.2 PRESENTATIONS BY GUESTS

Prof. Désiré AVOM, Yaounde II University, Cameroon, Sharing experience on ex post evaluations of projects

T. CHEMANGANG, ECTA BTP, Cameroon, The ex-ante economic evaluation of road projects in Cameroon

Prof. Harry T. DIMITRIOU, University College London, OMEGA Centre's International Research Programme Findings Regarding Use of Public Private Partnership (PPP) Arrangements in Decision-making in the Planning, Appraisal & Delivery of Mega Transport Projects

Jay JAYASUNDARA, Isle of Wight Council, Highways PFI (Private Finance Initiative) – practitioner's view

Kangsoo KIM, PIMAC, Korea Development Institute, South Korea, Preliminary Feasibility Study for Large Scale Projects

Prof. Valerie ONGOLO, University of Yaounde II, Cameroon, Economic evaluation of road infrastructure projects in sub-Saharan Africa as part of the Public / Private Partnerships

Gustave SONON, Economic model for ex post evaluation of road project in finalizing in Benin

2.3 ROUTES/ROADS ISSUE 356, 2012

A ROUTES/ROADS issue (No 356) was dedicated to the ex ante-evaluation of road investments. TC 1.4 provided several inputs to this issue:

- Karl-Josef Höhnscheid, Introductory article, New developments in the evaluation of road projects.
- Maurizio Rotondo, Social impacts of road projects and road pricing effects. Key findings.
- Jan-Andre Bühne, Regulatory impact analysis of transport legislation in Germany.
- Namgeon CHO and Hyeon PARK, Preliminary feasibility study for road projects incorporating balanced regional development.
- Thomas GRÜNSTÄUDL and Wolfgang SCHWARZBERGER, Assessing the economic and tax-revenue effects of the construction of the S8 Marchfeld expressway in Austria
- Teiji GOTO, Hirotaka SEKIYA, Tohru TAMURA and Tetsuya YAMADA, A new scheme for evaluating road projects by considering their effects after disasters – A challenge for Japan just after the great earthquake of March 2011

The issue was reviewed by TC-members Manon Baril, Fred Amonya, Haydee Alicia Lordi, Egidijus Skrodenis and Karl-Josef Höhnscheid.

2.4 PIARC-CONFERENCE

A PIARC-conference about "Economic Aspects of Road Networks and Social Development" had been organised in Yaounde, Cameroon. The conference was supported by the Ministère des Travaux Publics of Cameroon and was dedicated to Western African infrastructure projects. Beside the TC1.4-members it was attended by around 80 experts and high ranked administratives from this region.

2.5 PIARC-STUDY ON THE IMPORTANCE OF ROAD MAINTENANCE

Two TC-members, Jan-Andre Böhne, Germany and Namgeon Cho, South Korea, accompanied a PIARC-financed study about the importance of road maintenance. The study delivered a statement on the importance of road maintenance backed by relevant scientific explanations and demonstrated the economic impact of maintenance of an existing network. The study included a particular focus on rural roads.

2.6 OTHER CONFERENCES AND WORKSHOPS

The TC-members had been invited by the CIHT to participate in the PIARC UK dinner debate and congress in Cardiff after the TC meeting in London. The TC was represented by TC-member Haydee Alicia Lordi at the 28th International Baltic Road Conference 2013 in Vilnius, Lithuania. The TC participated in the ITF/OECD Round Table on Ex Post assessments of transport investments and policy interventions” on September 15th/16th, 2014 in Paris. Several TC-members attended TRB-events in Washington.

**TECHNICAL COMMITTEE 1.5
RISK MANAGEMENT**

2012-2015 ACTIVITY REPORT

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COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

[Members]	
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Robert LORANGER	French-speaking secretary, Canada-Quebec
Johanne LEGAULT	French-speaking secretary, Canada-Quebec
Pedro Tomás Martínez (May 2013 ~)	Spanish-speaking secretary, Spain
Enrique BELDA ESPLUGUES (~ May 2013)	Spanish-speaking secretary, Spain
Richard FRENETTE	WG1 Leader, Canada-Quebec
Christian STEFAN	WG2 Leader, Austria
Ioannis BENEKOS	WG3 Leader, Greece
Maarten BLOMME	Web Master, Belgium
Edgardo MASCIARELLI	Argentina
Andrew EXCELL	Australia
Heimo BERGHOLD (Oct 2013 ~)	Austria
Robert LISKOUNIG (~ Oct 2013)	Austria
Alain LEFEBVRE	Belgium
Francis NDOUMBA MOUELLE	Cameroon
Kizito NGOA	Cameroon
Jan GRUBER	Czech Republic
Trine HOLST VEICHERTS	Denmark
Pierre CHARCELLAY	France
Jürgen KRIEGER	Germany
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Tobias SCHAEFER	Mexico

1. OVERVIEW OF THE TECHNICAL COMMITTEE 1.5, RISK MANAGEMENT, 2012-2015 CYCLE

1.1. General

Risk assessment and management is fundamental to the operation of a transport network. Technical Committee 1.5 (TC 1.5) focuses on the role of risk assessment in policy development and decision making, risk assessment and management methodologies, and emergency management. This includes the study of combined and large magnitude hazards, the consequences of which might reasonably be described as disastrous or catastrophic.

TC 1.5 lays special emphasis on integrated risk management with expanded research into risk assessment, decision-making processes, risk treatment, risk management tools, and emergency management. More specifically TC 1.5 has the four terms of reference:

- 1) Role of risk assessment in policy development and decision making
- 2) Methodologies and tools for risk assessment and management applied to road operations
- 3) Management of emergency situations
- 4) Risk and emergency management for combined and large hazards

1.2. Activities

Since the beginning, TC 1.5 has been making considerable efforts to achieve its objectives.

- 1) Eight TC 1.5 meetings including one to be held in Korea
- 2) Formulation of three working groups and production of working group reports
 - WG1: Role of risk assessment in policy development and decision making
 - WG2: Methodologies and tools for risk assessment and management applied to road operations
 - WG3: Management of emergency situations and Risk and emergency management for combined and large hazards
- 3) International survey
- 4) Two international seminars in Merida Mexico and Xi'an China
- 5) Three international workshops in Osaka Japan, Rome Italy, and Adelaide Australia
- 6) Publications
- 7) Collecting case studies







Photo 1. Technical committee members (TC 1.5)

2. WORK PROGRAMMES AND ORGANIZATIONS

2.1. Work programmes

The work programmes of TC1.5 were organized as follows:

Table 1. Meetings, Workshops and Seminars

No.	Date	Place	Summaries
1	07 and 08 March 2012 	Paris, FRANCE	<ul style="list-style-type: none"> 26 participants [Meeting] Opening and introduction of technical committee Presentations on productions in the previous cycle Discussions on the issues assigned to the technical committee and formulation of working groups Planning of international seminars and workshops Appointment of the Terminology Coordinator and Web Master
2	14-16 November 2012 	Madrid, SPAIN	<ul style="list-style-type: none"> 30 participants [Meeting] Discussion on the work programs 1.5.1, 1.5.2, 1.5.3, and 1.5.4 by each working group Planning of international questionnaire Presentations of case studies in Spain and Japan International seminars Technical visit to Calle 30 and tunnel
3	28-29 May, 2013 	Osaka, JAPAN	<ul style="list-style-type: none"> 30 participants [Meeting] Completion of the work programs 1.5.1, 1.5.2, 1.5.3, and 1.5.4 Summary and discussion on international questionnaire Technical visit to Hanshin Expressway including its Traffic Control Center [Workshop] Hold the 1st international workshop with IRF, REAAA and JRA
4	7-8 October 2013 	Merida, Mexico	<ul style="list-style-type: none"> 26 participants [Meeting] Discussion on the table of contents of the WG reports Summary and discussion on international questionnaire Identification of the individual contributions and start drafting the report Technical visit to highways in Yucatan peninsula [Seminar] Hold the 1st international seminar with AMIVTAC, DIRCAIBEA, IMT and Yucatan Government

5	26-27 May 2014	Milan, ITALY	<ul style="list-style-type: none"> 28 participants [Meeting] Completion of the table of contents of the WG reports Identification of the individual contributions and drafting the report Coordination of individual contributions within each WG Technical visit to Autostrade [Workshop] Hold the 2nd international workshop with POLIMI and the Italian National PIARC Committee
6	10-11 November 2014	Xi'an, CHINA	<ul style="list-style-type: none"> 20 participants [Meeting] Coordination of individual contributions within each WG Development cross check system for quality control Translation of the final reports [Seminar] Hold the 2nd international seminar with Key Laboratory of Cold and Arid Regions Highway Engineering, Key Laboratory of Shaanxi Provincial Highway Traffic Disaster Prevention and Mitigation, and Shaanxi Provincial Highway Institute
7	10-11 March 2015	Adelaide, AUSTRALIA	<ul style="list-style-type: none"> 24 participants [Meeting] Completion of English WG reports Cross check of each English WG report Translation of English WG report into French [Workshop] Hold the 3rd international workshop with the Government of South Australia and Austroads
8	2-6 November 2015	Seoul, KOREA	<ul style="list-style-type: none"> All members [Meeting] Final meeting for the technical session of World Road Congress Final conclusion of technical committee activities and findings

2.2. Work organizations

TC 1.5 has the four terms of reference and formulates three working groups:

1) Technical committee steering members

Chairman:	Keiichi TAMURA (Japan)
English-speaking secretary:	Yukio ADACHI (Japan)
French-speaking secretary:	Robert LORANGER (Canada-Quebec)
Spanish-speaking secretary:	Pedro TOMAS MARTINEZ (Spain)
WG 1 leader:	Richard FRENETTE (Canada-Quebec)
WG 2 leader:	Christian STEFAN (Austria)
WG 3 leader:	Ioannis BENEKOS (Greece)
Web master	Maarten BLOMME (Belgium)
Liaison person for terminology	Enrique BELDA ESPLUGUES (Spain)

2) Working Group 1 “Role of risk assessment in policy development and decision making”

Issue 1.5.1 Role of risk assessment in policy development and decision making	
STRATEGIES	OUTPUT
Analyze how risk assessment is being used and incorporated in policy development and decision making within the road authorities.	State-of-the-art report and recommendations for road authorities.
Up-date the work of TC C.3, of the previous cycle, on public perception and acceptance of risk regarding the road transport system, including recent events.	Up-dated report on public perception and acceptance of risk.

Leader Richard FRENETTE (CAN-QBC)
 Co-leader: James LAMBERT (USA)
 Co-leader: Takumi UNO (JPN)
 Co-leader Maurizio CRISPINO (ITA)
 Andrew EXCELL (AUS)
 Rebecca TIMMIGS (AUS)
 Robert LISKOUNIG (AUT)
 Trine HOLST VEICHERTS (DEN)
 Pierre CHARCELLAY (FRA)
 Vahid KAMAL-ALAVI (ITA)
 Myungsik DO (KOR)



Photo 2. Working Group 1 members

2) Working Group 2 “Methodologies and tools for risk assessment and management applied to road operations”

Issue 1.5.2 Methodologies and tools for risk assessment and management applied to road operations	
STRATEGIES	OUTPUT
Identify and evaluate methodologies and tools for the management of natural and man-made risks in road operations and subsequent decision making.	Further development of a tool box as part of the Association’s web-based knowledge base for dissemination of basic risk management techniques in the road community.
Identify strategies applied to manage the risks	Case studies on techniques for managing the risks

associated with natural and man-made hazards including the adaptation of road infrastructure to climate change.	associated with natural and man-made hazards including the adaptation of road infrastructure to climate change.
Integration in a web-based manual of the outputs of the current and past cycles.	Web-based electronic version of a Risk Management Manual.

Leader Christian STEFAN(AUT)
 Leader Manfred JUNGO (CHE)
 Leader Jürgen KRIEGER (GER)
 Co-leader: Gustavo MORENO RUIZ(MEX)
 Co-leader: Ileana MENA(MEX)
 Edgardo MASCIARELLI (ARG)
 Heimo BERGHOLD (AUT)
 Alain LEFEBVRE (BEL)
 Keiichi TAMURA (JPN)
 Hiroaki MIYATAKE (JPN)
 Shinjuro KOMATA (JPN)



Photo 3. Working Group 2 members

3) Working Group 3 “Risk management in emergency situations”

Issue 1.5.3 Management of emergency situations	
STRATEGIES	OUTPUT
From selected case studies analyse how emergency situations affecting the road transport system are managed. Investigation will consider in particular the issues of coordination between the different authorities, the coordination between the different modes of transport, the information to users, the response of the public.	Recommendations based on a presentation of case studies.
Issue 1.5.4 Risk and emergency management for combined and large hazards	
STRATEGIES	OUTPUT
Analyse how risk / emergency management is undertaken from case studies of combined / large scale hazards (e.g. earthquake/ tsunami, earthquake / landslide).	State-of-the-art report and recommendations for road authorities preparing for such scenarios.

Leader Ioannis BENEKOS(GRE)
 Co-leader: Maarten BLOMME(BEL)
 Co-leader: Yukio ADACHI(JPN)
 Francis NDOUMBA MOUELLE (CAM)
 Kizito NGOA (CAM)
 Jan GRUBER (CZE)
 Eui-Joon LEE (KOR)
 Hyeok Jin CHOI (KOR)
 Brett GLIDDON (NZL)
 Enrique BELDA ESPLUGUES (SPN)
 Pedro TOMÁS MARTÍNEZ (SPN)
 Constantin ZBARNEA (ROM)
 Vasile POPA (ROM)



Photo 4. Working Group 3 members

3. SUMMARY OF THE FINAL REPORT

3.1. Role of Risk Assessment in Policy Development and Decision Making

3.1.1. Introduction

Transportation systems in general, and road systems in particular, play a key role in the economy and the safety of our modern societies. However, keeping the expected functionality of road networks is a non-trivial exercise of balance. Between the pressure of increasing population, urbanization, global warming and cumulated maintenance deficit, road organizations have to deal with limited financial, human and/or expertise resources. This generates difficult decision-making situations that involve not only identifying where money is the best spent to serve the mission, but also how to manage risks arising from money not spent. In this context, having an integrated risk management policy should be an essential component of any organization to ensure optimal money spending as well as transparent responsibility and accountability management. Yet, formalized risk management is still a distant goal for many road authorities.

In this context, PIARC has identified the *Role of risk assessment in policy development and decision making* as one of its key issues under the theme *TC 1.5 Risk Management* of its work program 2012 - 2015. A workgroup (WG1) composed of members from Australia, Austria, Canada-Quebec, Denmark, Italy, Japan and USA has been assembled for that purpose. The following strategies and activities have been selected to address this issue:

- Characterize the formal use of risk management in road policy development and decision-making processes, including formal and/or non-formal considerations of the public perception and acceptance of risk.
 - An international survey has been put together and integrated with the two other WG of the Risk management (1.5) theme. It has been distributed to all organizations represented by members of TC 1.5.
- Investigate the role of risk management in policy development decision making in road authorities based on the study above.
 - The results of the survey have been analyzed to identify the level of risk management policy associated with each main activities of the selected organizations. Best practices have also been identified.
 - In parallel with the survey, members of WG1 have contributed with case studies of risk management policies in use in their respective organizations.
 - The production of this report constitutes the main deliverable.
- Produce general conclusions and recommendation and produce a summary report of risk management practices featuring organizational risk management.
 - Some specific questions of the survey have been tailored to address this question.
 - A special section of this report produces the result of analyzing the answers obtained for these specific questions.
- Propose a special session for public perception and acceptance of risk
 - The main results of these activities will be presented during a special session of 25th World Road Congress to be held in Seoul in November 2015.
 - Other publications/presentations have been made by the workgroup during the international seminars held over the 2012-2015 cycle.

3.1.2. Structure of the report

The report has been structured to address the two terms of reference associated with WG1:

- Executive summary
- Chapter 1: Introduction
- Chapter 2: Risk management in policy development and decision making
- Chapter 3: Public perception and acceptance of risk
- Chapter 4: Conclusions
- Appendices:
 - A: Glossary
 - B: References
 - C: Survey results for WG1 and WG2
 - D: Additional case studies for term of reference 1: Risk Policy
 - E: Additional case studies for terms of reference 2: Public perception

Chapter 2 constitutes the major part of the report. It has been decomposed according to the different types of activities associated with the phases of project management, namely:

- Section 2.1: Project planning and designing
 - 2.1.1: Project selection
 - 2.1.2: Project planning
 - 2.1.3: Project design
 - 2.1.4: Procurement and financing
- Section 2.2: Construction
- Section 2.3: Operations and maintenance
- Section 2.4: Human resources, governance and organization



Figure 1. Report structure of Role of Risk Assessment in Policy Development and Decision Making

3.2. Methodologies and Tools for Risk Assessment and Management Applied to Road Operations

3.2.1. Introduction

This section is prepared by WG2, Methodologies and Tools for Risk Assessment and Management Applied to Road Operations, which addresses the following aspects:

- Methodologies and tools for risk assessment and management;
- Development of road disaster management system based on risk management techniques;
- Managing risks in relation to climate change; and
- Web-based risk management manual.

3.2.2. Methodologies and tools for risk assessment and management

Almost any type of society heavily depends on a functioning infrastructure system. This is especially true during the occurrence of disastrous events, as intact infrastructure functionality becomes crucial for tackling damage and loss mitigation in other sectors. Risk assessment is a systematic approach to analyze sequences and interrelations in potential incidents or accidents, hereby identifying weak points of the system. A state-of-the-art risk assessment procedure is usually characterized by the following step by step procedure:

1. Risk analysis
2. Risk evaluation
3. Risk Management.

WG2 looked into different ways to assess risk methodologies and identifies potential hazards on road networks systems and on the natural environment.

3.2.3. Development of road disaster management system based on risk management techniques

We conducted a study on the development of a practical road disaster management system for various natural disasters by applying risk management techniques. Risk is defined here as the product of the likelihood of disastrous event and its consequences. The road facilities targeted are bridges, embankments, tunnels, slopes, and so forth. Various natural disasters such as earthquakes, tsunamis and heavy rainfalls are included in the analysis. Both direct and indirect damages are assumed in the present study. The former includes human damage and the restoration cost of damaged facilities, while the latter includes economic loss associated with traffic detouring. Particular emphasis is put on rating the risks to various road facilities due to different natural disasters by using a common index. The results are presented through a risk curve, risk register table, and risk treatment plan, which are readily applicable to road disaster management.

3.2.4. Managing risks in relation to climate change

In the 20th century, the worldwide average temperature increased in more than half a degree. In the countries where greenhouse effect gases due to fossil fuel burning is bigger, temperature is increasing faster, reaching a 1°C difference. In addition to the blistering heat, a consequence of global warming is rain violence in some regions. Climate change is changing the actual risk levels and therefore challenging design rules and procedures for the operation and maintenance of the road infrastructure. There will be an increase in unusual climatic events with significant impacts on infrastructures, operations and the economy at large. For example, immediate actions are necessary to allow the road being in operation against landslides. Close coordination between road administrators and relevant organizations including the private sector, e.g., pre-event agreement on cooperation in case of a disastrous event, is efficient for such emergency management.

3.2.5. Web-based risk management manual

Risks to roads and road traffic caused by natural and human-induced hazards and climate change are increasing, creating an urgent need to share ideas on how to manage these risks. It is worthwhile to share risk management techniques and their practices among the road administrators and the relevant parties. A web-based risk management manual was proposed to share and disseminate such knowledge and practice as a common property of PIARC. The web-based risk management manual was designed with a user-friendly and graphical interface to the road risk management SQL Database. It is equipped with a robust search engine, and pull-down menus, and was built using an open source software (Drupal, mySQL). The proposed web-based manual has a structure to make finding information easy, and consists of several pull-down menus such as inventory sheets, archives and links.

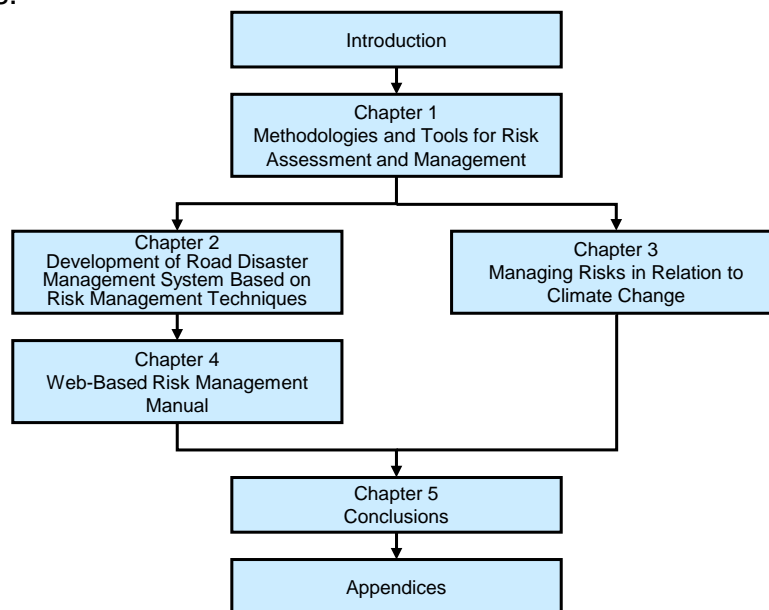


Figure 2. Report structure of Methodologies and Tools for Risk Assessment and Management Applied to Road Operations

3.3. Risk Management for Emergency Situations

3.3.1. Introduction

Road transport is critical to the economic vitality of a country. Effective management of emergency situations and risk and emergency management for combined and large hazards that may disrupt the operation of the road network calls for cooperative and coordinative actions among several parties of the road and non-road sector, government agencies, the private sector, rescue services and road users.

Preparedness, response and recovery constitute the three major phases of emergency situation planning and action. Consultation and appropriate communication with road stakeholders before, during and after the occurrence of an emergency situation are key to ensuring that planning and action take into consideration and integrate legitimate concerns, stakes and experience from all parties.

Advances in technology and the progressive integration of Intelligent Transportation Systems (ITS) in road operation and surveillance have radically changed traditional approaches in preparing for, responding to and recovering from an emergency. Benefits from use of ITS systems in risk and emergency situation management clearly demonstrate the need to integrate practices from transportation management and emergency operation so that an integrated approach is considered to improve situational awareness and provide informed decision-making.

In this report, an effort was made to analyze world practices in emergency situation management and present integrated frameworks for risk and business continuity management so as to produce recommendations for best practices in managing risk and emergency situations both in general and in the road network in particular.

To this respect, an International Survey was also conducted to identify relevant case studies. Contributions from participating countries produced a number of case studies with related experience from various natural disasters of extraordinary magnitude. For managing these disasters in the road network, preparedness should be up to date and new concepts are needed related to the robustness and self-sustainment of the road network.

To ensure continued road operation before, during and after disaster occurrence, the concept of dynamic risk management is introduced. Monitoring and reviewing of the risk management framework and of the accumulated experience and learned lessons are fundamental components for effective management of emergency situations and continuous improvement of relevant frameworks.

3.3.2. Structure of the report

The structure of this report is represented below (Figure 3.) which is followed by a brief explanation for the content of each Section:

Section 1 provides a general Introduction to this report.

Section 2 presents risk, business continuity and emergency management principles.

Section 3 is relevant to Issue 1.5.3: it presents cooperative and collaborative actions between organizations in emergency situations, application of Intelligent Transportation systems (ITS) to road operation practices for emergency management and public response, and good practices for preparedness, recovery and restoration of the road network for continued road operation.

Section 4 is relevant to Issue 1.5.4: it provides a definition for combined and large-scale disasters and an international insight on relevant risk and emergency management practices and experiences.

Section 5 summarizes the conclusions of the report.

Section 6 presents a listing of References and provides a Glossary of terms.

Appendix A provides case studies and methodologies relevant to Section 3 (Issue 1.5.3) from international experience with emergency management of ordinary hazards.

Appendix B provides experience sheets relevant to Section 4 (Issue 1.5.4) from international experience with risk and emergency management of large scale / combined hazards.

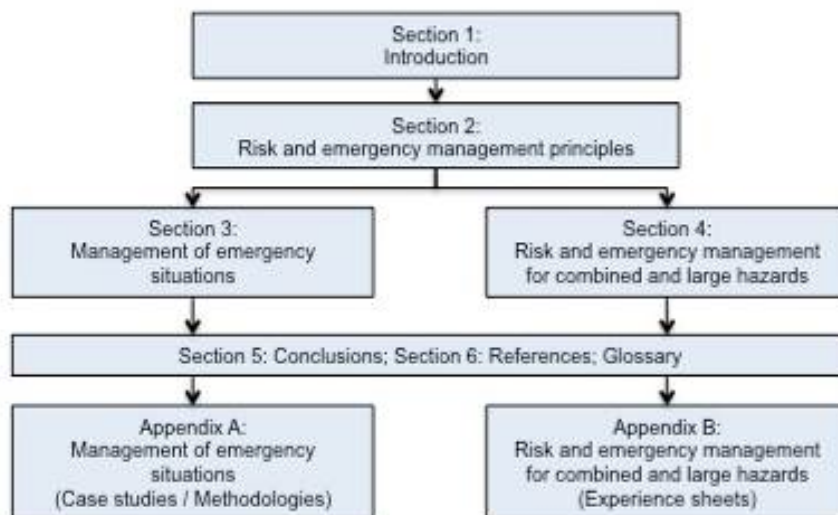


Figure 3. Report structure of “Risk Management in Emergency Situations

In addition to case studies and methodologies collected internationally, an international survey was conducted with respect to best practices, coordination and risk management techniques and frameworks applied in emergency situations. The major findings of this international survey related to large-scale and combined hazards are summarized in Section 4.

4. INTERNATIONAL SURVEY

TC 1.5 carried out an international survey to understand the current status of risk management practices in the PIARC member countries. The survey consisted of questionnaires related to four main themes reflecting the TC's terms of reference; 1) Risk management policy, process, monitoring and reviewing per organization and activity, 2) Types of risks conducted by organization, 3) Integration of public perception, 4) Measurement, incentives and recommendations related to risk management activities of each organization. We received 24 answers from 16 countries.

1) RISK MANAGEMENT POLICY, PROCESS, MONITORING AND REVIEWING PER ORGANIZATION AND ACTIVITY

As the general management strategy, "Proactive" or "Strategic" were high especially in the phase of initial stage of road project. However, for the maintenance and operation, more organization answered "reactive" or "preventive". Regardless of the phase, many organizations answered that they have already had risk management policy as strategic objectives only or common risk management policy in organization. Many organizations have already established the common risk management process for the whole organization and some organizations already have risk management process in each department/service/function of several phases. Many organizations replied that they review the process periodically. In addition, except for the road operation phase, some of them answered that the monitoring/reviewing were based on individual effort.

2) TYPES OF RISKS CONDUCTED BY ORGANIZATION

In the case of the frequent disasters, there were many answers to have a risk management strategy by an external or internal document. However, for the global disasters such as acid rain, sea level rise, most organizations answered that they do not

correspond. In the case of human disasters, many organizations have already had response strategy for the risks surrounding vehicles or road. In the case of "Radiation damage" or "spill of hazardous material", many organizations responded that they do not consider the conduct strategy.

3) INTEGRATION OF PUBLIC PERCEPTION

The survey inquired how to integrate public perception and acceptance to risk management by organization. Most answers belonged to two groups. One is "indices" to illustrate public perception/acceptance, and another is "methods" to understand public perception and acceptance.

4) MEASUREMENT, INCENTIVES AND RECOMMENDATIONS RELATED TO RM ACTIVITIES OF EACH ORGANIZATION

Improvement of safety, enhancement of the level of service, effectiveness for the crisis management, maximization of the benefit, win of funding and financial planning, political requirement are the incentive for the risk management. Key words of the risk management's value are preparedness, covering political risk, responsive decision, common understanding, reduction of casualty, effective and safe operation, reduce of time of intervention are pointed out. Recommendation or advice are collaborative approach with all hazard approach, strong decision criteria, top management engagement and scenario, better integration among authorities, collaboration with other infrastructure agencies, long-term risk management.

5. INTERNATIONAL SEMINARS AND WORKSHOPS

5.1. 1st International Seminar in Merida, Mexico

The International Seminar on Risk Management for Highway Infrastructure was held at the Hotel Presidente Intercontinental Villa Mercedes Merida in Merida, Mexico, on October 9-11, 2013. This seminar was jointly organized by TC 1.5 and the Mexican Association of Road Engineering (AMVITAC) in cooperation with the Board of Road Directors of Iberia and Latin America (DIRCAIBEA), and the Mexican Transport Institute (IMT), the Government of Yucatan, and was supported by SESPEC Insurance Brokers.

The two-day seminar consisted of four technical sessions and two keynote presentations with a large audience including experts from governments, academia and the private sector both from Mexico and abroad. Two keynote presenters were invited from Spain and the Dominican Republic as part of the cooperation with DIRCAIBEA.

In addition to the technical meeting, a technical visit to the Yucatan highway was organized.



Photo 5. Seminar in Merida, Mexico



Photo 6. Seminar audience

5.2. 2nd International Seminar in Xi'an, China

The International Seminar on Disaster Prevention and Mitigation Technologies and Inputs from ITS in Network Operations was held at the Shaanxi Hotel in Xi'an, China, on November 12-14, 2014. This seminar was jointly organized by TC 1.5, TC 2.1, Key Laboratory of Cold and Arid Regions Highway Engineering, Key Laboratory of Shaanxi Provincial Highway Traffic Disaster Prevention and Mitigation, and Shaanxi Provincial Highway Institute, and was supported by CCCC First Highway Consultants Co., Ltd.

The two-day seminar consisted of four technical sessions and a technical exhibition with a large number of participants including experts from governments, academia and the private sector both from China and abroad. The keynote presentations covered various fields of risk and emergency management methodologies and applications from China and Mexico.

On the last day of the seminar, the participants visited the monitoring center of Zhongnanshan tunnel, which is the world's second longest road tunnel. They were very impressed by the safety operation techniques and the various emergency management measures adopted there.



Photo 7. Seminar in Xi'an, China

5.3. 1st International Workshop in Osaka, Japan

The International Workshop on Risk and Emergency Management for Roads was held at the Osaka International House in Osaka, Japan on May 29-30, 2013. This workshop was jointly organized by TC 1.5, the International Road Federation (IRF), the Road Engineering Association of Asia and Australasia (REAAA), the Japan Road Association (JRA) and the Hanshin Expressway Co., Ltd. The IRF Disaster Relief Fund to JRA was appropriated for holding the workshop with other funds.

The two-day workshop consisted of the three keynote presentations, two invited presentations and five technical sessions with a large audience including experts from governments, academia and the private sector. Two keynote presenters were invited from the U.S. and Indonesia to the workshop with the cooperation of IRF and REAAA.

In addition to the technical meeting, a technical visit to the traffic control center of Hanshin Expressway was organized. The participants observed how they collect and process information, and operate the traffic with the latest technology so as to maintain the smooth traffic flow in the metropolitan area.



Photo 8. Workshop in Osaka, JAPAN



Photo 9. Workshop audience

5.4. 2nd International Workshop in Milan, Italy

The International Workshop on Road Risk Management was held at the Polytechnic University of Milan in Italy, on May 28, 2014. This workshop was jointly organized by TC 1.5, the Italian National PIARC Committee and the Polytechnic University of Milan.

The full one-day workshop consisted of four technical sessions and a technical exhibition with a large number of participants including experts from governments, academia and the private sector both from Italy and abroad.

In addition to the technical meeting, a technical visit to the traffic control center of Autostrade was organized. The participants visited Monza circuit at the end of the technical visit.



Photos 10 and 11. 2nd international workshop in Milan, Italy

5.5. 3rd International Workshop in Adelaide, Australia

The International Workshop on Risk Management in Traffic and Road Operations was held at the Playford Hotel, Adelaide, Australia, on March 12, 2015. This workshop was jointly organized by the World Road Association (PIARC) Technical Committee 1.5 on Risk Management and the Government of South Australia, and was supported by Austroads and the ARRB group.

The full one-day workshop consisted of three technical sessions with a large number of participants including experts from governments and the private sector both from Australia and abroad. Eight presentations were delivered by Australian and international experts. They included the latest risk and emergency management techniques, and the application of risk management to project and traffic management.

In addition to the workshop, the participants visited the South Australian Traffic Management Centre, where a discussion occurred on their latest control system with driver centric approach.



Photos 12 and 13. 3rd international workshop in Adelaide, Australia

6. PUBLICATIONS

6.1. Route and Roads articles

[Number] Routes/Roads No.364

[Title] Disaster management for Tokyo inland earthquakes in Japan

[Authors] Toshiharu Yoshida (JPN), Keiichi Tamura (JPN) and Hiroaki Miyatake (JPN)



[Number] Routes/Roads No.364

[Title] Lessons in managing emergency situations learned from various disaster experiences

[Authors] Yukio Adachi (JPN) and Maarten Blomme (BEL)



[Number] Routes/Roads No.364

[Title] Risk and emergency management as a basis for road intelligent transport system (ITS) planning and operations

[Authors] Enrique Belda Esplugues (SPN), Pedro Tomás Martínez (SPN) and Ioannis Benekos (GRE)



[Number] Routes/Roads No.364

[Title] An innovative training for road operations

[Authors] Pierre Charcellay (FRA)



[Number] Routes/Roads No.364
 [Title] Traffic control centres, organizations and role in traffic risk and incident reduction
 [Authors] Athanasios Saramourtsis(GRE), Athanasios Tsantsanoglou(GRE), Evangeles Viskos(GRE) and Ioannis Benekos(GRE)



6.2. Route and Roads, Introductions of seminars and workshops



6.3. Proceedings

[Seminars]

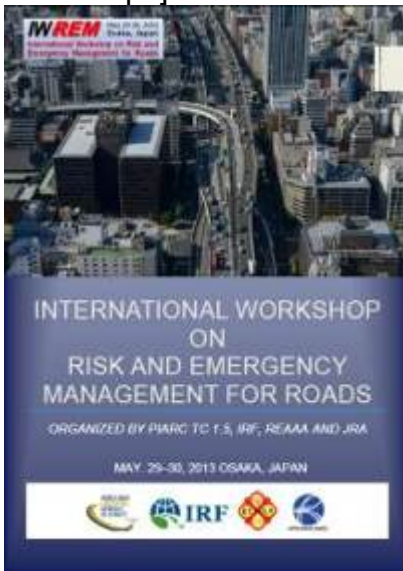


International Seminar on Risk Management for Highway Infrastructure in Merida, Mexico



International Seminar on Disaster Prevention and Mitigation Technologies and Inputs from ITS in Network Operations in Xi'an, China

[Workshops]



International Workshop on Risk and Emergency Management for Roads in Osaka, Japan



International Workshop on Road Risk Management in Milan, Italy



International Workshop on Risk Management in Traffic and Road Operations in Adelaide, Australia

7. COLLECTED CASE STUDIES

There are a lot of papers regarding risk management for roads in the meetings and seminars as shown in the following Table 2.

Table 2. Collected case studies

Meetings and events	Number of collected case studies
2nd International Committee Meeting in Madrid (November, 2012)	4
3rd International Committee Meeting and 1st international workshop in Osaka (May, 2013)	19
4th International Committee Meeting and 1st international seminar in Merida (October, 2013)	15
5th International Committee Meeting and 2nd international workshop in Milan (May, 2014)	18
6th International Committee Meeting and 2nd international seminar in Xi'an (November, 2014)	22
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TECHNICAL COMMITTEE 2.1: ROAD NETWORK OPERATION

2012-2015 ACTIVITY REPORT

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COMMITTEE MEMBERS AND CONTRIBUTIONS

1.1. Contributors to this report

Authors :

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John Miles, England,

Valentina Galasso, Italy

Michele Adiletta, Italy

Petteri Portaankorva, Finland

Daniel G. Russomanno, Argentina

Mr. Yukio Adachi and Mr. Keiichi Tamura, Japan, (TC1.5) for the Xi'an Seminar minutes

Reviewers:

Jorge Acha, Argentina

Kian Keong Chin, Singapore

Translators :

English to French : Sylvain Belloche, France

English to Spanish : Daniel Russomanno, Argentina

English to Korean : Seungjun Lee, South Korea

1.2. TC meetings

In addition to the kick-off (KO) meeting, six meetings were held:

- KO : March 21-22, 2012, Paris, France
- 2nd : October 28-29, 2012, Vienna, Austria
- 3rd : May 30-31, 2013, Singapore
- 4th : November 4-5, 2013, Buenos Aires, Argentina
- 5th : June 3-4, 2014, Johannesburg, South Africa
- 6th : November 10-11, 2014, Xi'an, China
- 7th : June 8-9, 2015, Rome, Italia

Below is the list of participants to the different meetings and seminars (in alphabetical order).

Country	Name of participants	KO	2 nd	3 rd	4 th	5 th	6 th	7 th	1 st seminar	2 nd seminar
Argentina	Bettadis Daniel - invited				✓				✓	
	Felizia Jorge				✓				✓	
	Russomanno Daniel	✓		✓	✓	✓			✓	
Austria	Bohm Martin		✓							
	Konzett Gilbert	✓	✓							
	Meissner Markus	✓	✓		✓				✓	
Australia	Millar Jeremy	✓	✓		✓		✓	✓	✓	
Belgium	Broes Alain	✓	✓	✓						
	Pourtois Caroline	✓	✓							
Bénin	Guidi Desire	✓	✓							
Canada - Quebec	Beland Odile					✓				
	Filion Lise	✓	✓	✓	✓				✓	
China	Dongqiang Yao						✓			✓
	Ruyu Zhao – invited					✓				
UK	Miles John	✓	✓							
	Patey Ian		✓							
	Richard Harris	✓								
	Wickham Lucy	✓	✓	✓						
Finland	Penttinen Merja – invited			✓						
	Portaankorva Petteri	✓	✓		✓	✓	✓		✓	✓
France	Bacelar Alexis	✓	✓		✓				✓	
	Bienvenue François	✓	✓	✓		✓				
	Chevreuil Martial	✓	✓							
	Ehrlich Jacques	✓	✓	✓	✓	✓	✓		✓	✓
	Frénéat Emmanuelle		✓		✓				✓	
Germany	Bush Fritz	✓	✓							
	Rau Andreas			✓		✓	✓			✓
	Xiaodong Liu – invited						✓			✓
Hungary	Tamas Tomaschek	✓								
	Valyi Zoltan	✓								
Italy	Adiletta Michele	✓	✓		✓	✓			✓	
	De Marinis Pierluigi - invited				✓		✓		✓	✓
	Galasso Valentina	✓	✓	✓	✓	✓	✓		✓	✓
Japan	Suzuki Shoichi		✓							
	Yamada Harutoshi			✓						
Mali	Seck Abdoulaye Yaya	✓	✓							
	Traore Mary	✓	✓	✓		✓	✓			✓
Poland	Kobzdaj Marcin		✓	✓	✓		✓	✓	✓	
Singapore	Kian-Keong Chin	✓	✓	✓	✓	✓			✓	
	Palanisamy Chandrasekar			✓						
Slovakia	Schlosser Tibor		✓							
South Africa	Naidoo Kersen	✓	✓	✓	✓	✓	✓		✓	✓
South Korea	Kim Kyuok				✓				✓	
	Lee Seungjun				✓	✓			✓	
Spain	Mosquera Alejandro	✓								
Sweden	Sundberg Jonas			✓			✓			✓
Switzerland	Suter Heinz	✓	✓		✓	✓			✓	
USA	Pol James		✓	✓						
	Shelley Row	✓								
Total number of participants		28	29	17	19	14	12	0	19	12

Table 1

1.3. Seminars

Two seminars were held:

- 1st seminar :
 - *Date and location:* November 6-7-8, 2015, Buenos Aires, Argentina,
 - *Title:* “Urban Mobility, Road Management and ITS Applications”
- 2nd seminar :
 - *Date and location:* November 12-13-14, 2015, Xi'an, China
 - *Title:*“Disaster Prevention and Mitigation, Technologies and Inputs from ITS in Network Operations”

List of participants to the seminars is given on Table 1 above.

1.4. Contributors to the Technical Report

Country	Contributor's Name	Issue 2.1.1			Issue 2.1.2			Issue 2.1.3		
		Author	Reviewer	Translator	Author	Reviewer	Translator	Author	Reviewer	Translator
Argentina	Daniel G. Russomanno	V	V							
Australia	Millar Jeremy		V		V	V			V	
Canada - Quebec	Beland Odile	V								
England	Harris Richard								V	
	Patey Ian								V	
	Wickham Lucy	V								
Finland	Portaankorva Petteri		V		V					
France	Alexis Bacelar							V		V
	Belloche Sylvain									V
	Chevreuril Martial									
	Ehrlich Jacques							V		V
	Frénéat Emmanuelle	V								
Italy	Adiletta Michele	V								
	De Marinis Pierluigi	V						V		
	Galasso Valentina	V						V		
South Africa	Naidoo Kersen		V		V			V		
Sweden	Sundberg Jonas									
Switzerland	Heinz Suter	V								

Table 2

1.5. Contributors to Case Studies

Authors/Reviewers/Translators (in alphabetical order)

	Adiletta Michele (Italy)	Bacelar Alexis (France)	Beland Odile (Canada - Quebec)	Bienvenue François (France)	Bross Alain (Belgium)	Bush Fritz (Germany)	Kiam-Keong Chin (Singapore)	Chevreuril Martial (France)	Ehrlich Jacques (France)	Felizia Jorge (France)	Filion Lise (Argentina)	Frénéat Emmanuelle (France)	Galasso Valentina (France)	Hautière N. (France) – out of TC	Kim Kyuok (South Korea)	Kurmaala Risto (Finland)	Meissner Markus (Austria)	Le Coeur P. (France) – out of TC	Lee Saunghyun (South Korea)	Millar Jeremy (Australia)	Naidoo Kersen (South Africa)	Patey Ian (UK)	Pol James (USA)	Portaankorva Petteri (Finland)	Rau Andreas (Germany)	Russomanno Daniel (Argentina)	Sundberg Jonas (Sweden)	Suter Heinz (Switzerland)	Tracee Mary (Ireland)	Yamada Harutoshi (Japan)	Wickham Lucy (UK)	
Authors	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Reviewers		V		V	V	V	V			V	V			V	V			V	V	V	V	V		V		V		V		V		V
Translators		V	V		V			V	V		V													V		V		V		V		V

Table 3

1.6. Reviewers of Modules for the RNO-ITS Web manual

Fritz Busch, Germany,
 Martial Chevreuril, France,
 Marcin Kobzdaj, Poland,
 Keith Keen, England
 John Miles, England

Ian Patey, England
 Daniel G. Russomanno, Argentina

2. TECHNICAL COMMITTEE ORGANIZATION

The TC21 was organized in accordance with the three Issue that have been assigned. Three work groups (WG211, WG212, WG213) were set up (Table 4).

TC 2.1 Directory and Agenda				
Last update : Version 6				
Technical Committee: TC 2,1	Name	Email address:		
Chair:	Jacques EHRlich	jacques.ehrlich@fsttar.fr		
English-speaking secretary	Richard HARRIS	richard.harris@xerox.com		
French-speaking secretary	Alexis BACELAR	alexis.bacelar@developpement-durable.gouv.fr		
Spanish-speaking secretary	Daniel G. RUSSOMANO	daniel.russomanno@itsargentina.org.ar		
Vice-Chair (Optional)				
TC Webmaster	Alexis BACELAR	alexis.bacelar@developpement-durable.gouv.fr		
Liaison person for Terminology Com	Lise Filon	lise.filon@mtq.gouv.qc.ca		
Nomination of:	Leader	Email address:	Co-leader	Email address
Working group leader 1	Adiletta Michele (IT), Galasso Valentina (IT)	m.adiletta@stradeanas.it valentina.galasso@mail-bjp.com	François Bienvenue (FR)	francois.bienvenue@eqis.fr
Working group leader 2	Petteri Portaankorva (FI)	petteri.portaankorva@ely-keskus.fi	Kersen Naidoo (ZA)	naidook@nra.co.za
Working group leader 3	Jacques EHRlich (FR)	jacques.ehrlich@fsttar.fr	Fritz Busch (DE)	fritz.busch@vt.bv.tum.de

Table 4 – TC21 Organization

In addition, an editorial team was set up. Its goal was to produce upgraded web-versions of the Association's ITS Handbook and Network Operations (RNO) Handbook (Table 5).

Editorial team	Name	Email adress
Editorial Team Chair	John Miles	jcm@ankerbold.co.uk
ITS Handbook Project Officer	Tom Kern	TKern@itsa.org
US DOT point of contact	James Pol	james.pol@dot.gov
WG 2.1.3 point of contact	Jacques Ehrlich	jacques.ehrlich@fsttar.fr
WG 2.1.1 point of contact	Michele Adiletta (DE)	m.adiletta@stradeanas.it
WG 2.1.2 point of contact	Petteri Portaankorva (FI)	petteri.portaankorva@ely-keskus.fi
Previous editorial team point of contact	Fritz Bush (DE)	fritz.busch@vt.bv.tum.de
PIARC Webmaster	Alain Charles	alain.charles@piarc.org
ITS Technical Editor (US DOT Contractor)	To be defined	

Table 5 – Editorial Team organization

Figure 1 shows the set-up of the TC21 board and how the Editorial Team fits in. Some comments are welcome.

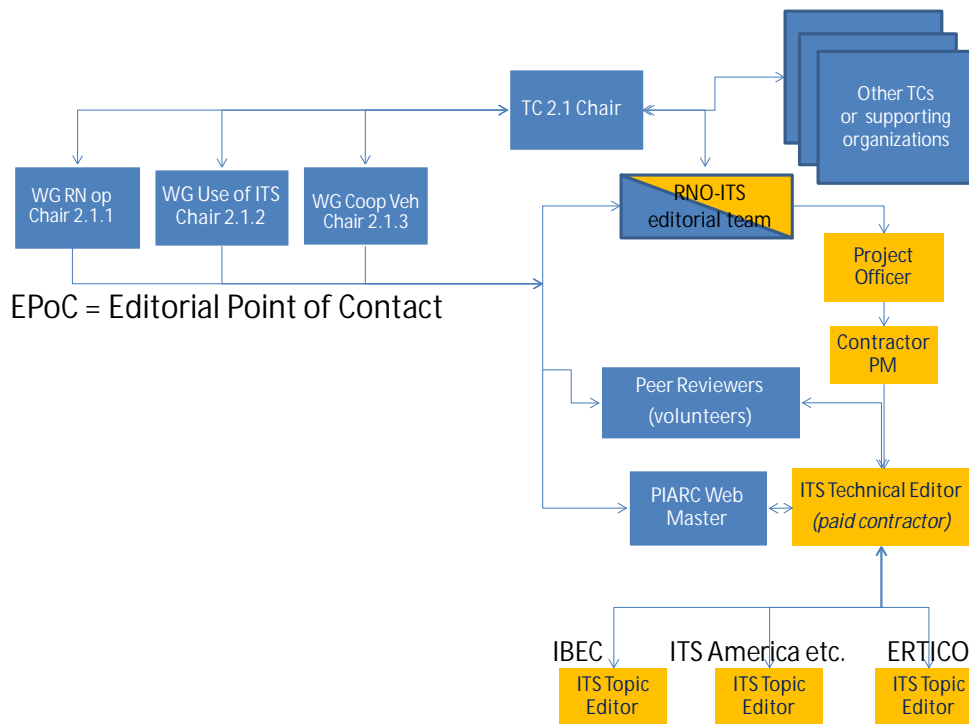


Figure 1 – TC21 Board-Editorial Team Organisation Structure

3. THE WORK PROGRAM

3.1. The three issues

The three issues, inherited from the previous cycle (2008-2011), were assigned to the committee as follows:

- **Issue: 2.1.1 - Road network management for improved mobility:** To investigate successful approaches and identify the factors taking into consideration for improved capacity, more reliable journey times, energy saving, safety and minimizing greenhouse gas emissions. Particular attention should be given to solutions considering interfaces with other modes and organisational/governance issues
- **Use of ITS including consideration of planning for future improvements and upgrades; consideration of economy:** To study more efficient and effective use of ITS from the perspective of the cost and benefit analysis, considering initial investment in the early stages, operating costs and future maintenance cost (full life cycle analysis). To investigate applications of ITS technologies in developing countries and identify those that are the most promising and relevant for these countries. Update and upgrade the Association's ITS Handbook.
- **Cooperative vehicle highway systems:** To investigate innovative approaches of better use of ITS for the purpose of improved network operation, with particular focus on vehicle-based technology and vehicle-infrastructure/vehicle-vehicle communications in cooperation with FISITA.

3.2. Method to develop the work program

The proposed method was developed in the first guidelines dated from January 2013 (J. Ehrlich, *Guidelines for the work program implementation*) and it is summarized below:

The output of our work will be the deliverable of the program. All or part of this deliverable will contribute to update or enhance the updated web version of RNO and STI handbooks.

The work program is divided in three issues. Each issue decomposes itself in 3 topics. Each working group leader is responsible for writing the part of the deliverable corresponding to its Issue with the help of the working group members.

The approach is bottom-up and top-down. We started by writing case studies (currently in an abstract form). The follow-on action is to develop the substantive text of the issue; the text is illustrated by case studies placed in the appendix. Finally, for each issue we make a synthesis of lessons learned, identify best practices and make recommendations.

3.3. Document structure

A unified document structure for the three issues was proposed:

- Issue 2.1.x
 - Introduction
 - Topic 2.1.x.1
 - Topic 2.1.x.2
 -
 - Topic 2.1.x.y
- Lessons learned
- Best practices and recommendation
- Bibliographical references
- Appendices:
 - Case Study 1
 - Case Study 2
 -
 - Case Study X
- Optionally : Survey results

3.4. Quality process

- Case study (CS) reviewing process. The process was described in a guideline (Jacques Ehrlich, *“TC21 reviewing process: Guideline for Workgroups leader, reviewer and author”*). It is summarized here. *The process involves three types of actors: workgroup leaders, reviewers and authors of the case studies. The WG leaders assign case studies to reviewers. The reviewers read the case study and fill an evaluation form. The authors follow instructions in the evaluation form, make corrections if requested and send the new version to the reviewer. Upon receipt of the updated case study, the reviewer updates the form setting the status as “Ready for translation”. The evaluation form (powered by Google Drive) contains: general information on CS, four criteria on content, two criteria on style. Each criterion is rated from 1 to 4. The best rate is the value 4.*
- Technical report reviewing process. The reviewing process of the three technical reports (Issue 211, 212, 213) is under the responsibility of each work group leader. They are asked to submit their report to reviewers external to the committee. However, intermediate review made by TC21 members is highly recommended. During the 6th plenary meeting a very fruitful “cross issue review” was performed, that is: Issue 211 was reviewed by WG212, Issue 212 was reviewed by WG213 and Issue 213 was reviewed by WG211. Finally the three reports will be reviewed by Jeremy Millar with the aim of unifying the English expression style.

4. RESULTS

The main results of the work performed during this cycle can be summarized as follows:

- Three Technical Reports in accordance with the three Issues assigned to the committee,
- About fifty case studies,
- Upgraded web-versions of the Association's ITS Handbook and Network Operations (RNO) Handbook.

Below is a summary of the topics addressed in these three Technical Reports.

4.1. Issue 1: Road network management for improved mobility

Nowadays improving the mobility of people and goods along the road network is one of the prior responsibilities of road administrations, governments and road institutions. The increasing importance of mobility to local, regional and global economies and to everyday life is reflected in a major awareness of the value of an efficient and effective road network operations management.

Only recently they started to really consider the road network as a whole, a complex and heterogeneous system where several dimensions, actors and parameters need to be evaluated. Since the amount of people and goods moving across countries and continents has highly increased, the need of communication between different networks becomes day by day more urgent. Mobility has grown even more central to the sustainability of human activities at national level and on countries' borders.

The introduction of new technologies, has substantially improved road network management: integrated communications, control technologies, data processing systems and information technology in general have now a fundamental role into the development and implementation of Intelligent Transport Systems

This Committee over the last few years focused on the understanding of all these parameters and analysed not only what ITS are but above all how and why ITS can enable a more effective road network management, better communication within different operators and improvement of information exchange with road users.

A more effective approach lies in increasing road performance without underestimating the role of road users' altogether with their needs and expectations, considering also how new media, i.e. social network and mobile applications reflect in a more conscious involvement from users' side, which are the real target of an efficient and effective road network management system.

4.2. Issue 2: Use of ITS including consideration of planning the economy for future improvements and upgrades

Nowadays road authorities provide a wide array of road network operation services to the general public and try to get the maximum benefit from the existing road network infrastructure at the same time. In this area of technology and services there is a need for knowledge-sharing of cost-benefit analyses and life-cycle considerations in the area of Intelligent Transport Systems (ITS) and its services.

ITS covers all transport modes and considers all elements of the transportation system - the vehicle, the infrastructure and the driver or user. ITS based information is a key tool

used by transportation professionals to improve the everyday mobility of people ITS applications are employed in improving traffic safety and security, helping to relieve traffic congestion and improving the efficiency of transportation systems covering all modes of transportation in a sustainable and user-friendly manner.

Generally, traffic and transportation volumes have been rising rapidly during the last decade all over the world, especially in metropolitan areas, including those of many developing countries. Economic growth typically has the effect of increases in both freight and passenger traffic, which may compound problems in a transportation system. ITS has been used to answer these transportation challenges and it will continue play a key role in securing the future of sustainable mobility. One reason for that is that building conventional infrastructure is very expensive and in many cases there is not more space for transport infrastructure expansion. From the perspective of the transportation system, ITS may be seen as an enabler for more efficient use of various transport modes based on real-time information and more efficient traffic signal systems in urban areas and traffic management systems on highways. Effective travel demand management can have significant effects in reducing the level of traffic congestion. There is wide consensus that these high-quality transportation connections for people and goods is an enabler for economical growth.

4.3. Issue 3: Cooperative vehicle highway.

Emergence of information and communication technology has strongly influenced the systems adopted for vehicles and for the road infrastructure.

On the vehicle side, embedded electronics today represents more than 30% of overall cost of vehicles. They are equipped with a multitude of sensors and actuators, many computers (ECU) and internal digital networks for interconnection (CAN bus, FlexRay bus, etc.).

On the road infrastructure side, they are equipped with many detection and information devices allowing the road operators to have knowledge of the network state and to develop and provide information or recommendations to users.

About fifteen years ago (2000s) the concept of **cooperative systems** was first introduced: vehicles, infrastructure, users, and road operators are interacting together thanks to telecommunications. This has been made possible by the emergence of new communication technologies (3G, 4G, DSRC, WAVE etc).

Thus, cooperative systems have widely contributed to improve transport system in its entire dimension: safety, mobility, accessibility and sustainability.

From the Road Operator point of view, the most promising application of cooperative systems is the concept of probe vehicle which introduces a new paradigm in terms of road network monitoring. We can fairly predict that in the near future most of the data that are up to now collected with road-based sensors and patrol vehicles will be delivered by probe vehicles or crowd-sourcing techniques. This will lead to reduced infrastructure investment and will probably open the way to their deployment in developing countries.

Finally, in the last 10 years we are witnessing the emergence of electric vehicles. That has been possible mainly thanks to progress made on batteries and electric motors. However, large scale deployment of electric vehicle will be strongly linked to the concept of **smart grid** ie. Intelligent and efficient infrastructure of energy management and distribution. And

the concept of smart grid itself is completely part of cooperative systems as it relies on communication between vehicle, road network operator and energy provider.

4.4. The RNO-ITS Web Manual

As part of the PIARC 2012-215 Strategic Plan, TC 2-1 was given the task of preparing an upgraded web-versions of the Association's ITS Handbook and Network Operations (RNO) Handbook. Funding was obtained from the U.S. Department of Transportation on behalf of PIARC, who contracted with the Intelligent Transportation Society of America (ITS America) to oversee the project. In turn, ITS America appointed as Editor to John Miles (PIARC Honorary Member - UK) with Finella McKenzie (UK) as the Associate Editor.

An Editorial Board was formed from the chair and workgroup leaders of TC2-1 Members plus co-options from USDOT and ITS America. The Editorial Board quickly settled on a plan to produce a web-based knowledge resource that combines both the RNO and ITS handbooks. The objective is to create an authoritative source of information based on practical experience, written for practitioners in need of technical advice on ITS for roads and intermodal operations, with a special emphasis on countries with economies in transition. The expected audience is a mix of policy-makers, transportation practitioners, professionals and students around the world working in transport planning, logistics, security and operations, transportation infrastructure, highways and traffic engineering, and vehicle engineering

The combined RNO-ITS Web Resource is a series of modules structured especially for website viewing, rather than a traditional book with chapters. The Modules contain case studies, multi-media content such as videos and links to related content in other modules. ITS America has subcontracted 19 module authors to develop the web-site content. Topics covered include road safety, network monitoring and operations, traveller support, passenger transport, freight and commercial services. Supporting information is included on the enabling technologies, systems engineering, ITS architecture, benefits of ITS, human factors, strategic planning, and deployment.

The on-line web resource will be launched at the XXVth World Road Congress in Seoul.

4.5. Case studies

See case studies summary in appendix 6.1.

5. OTHER ACTIVITIES, PRODUCTIONS AND EVENTS

5.1. 1st seminar : Urban Mobility, Road Management and ITS Applications

The seminar in brief.

This was held on 6-8 November 2013 in the City of Buenos Aires, República Argentina, and had its theme "Urban Mobility, Roads Operation and ITS Applications". This was organized by the Argentinean Roads Association, the World Association PIARC and the National Roads Administration of that country, and supported by the Civil Association ITS Argentina and the Traffic Engineering Society SAIT.

The opening ceremony was conducted by the Director of Diffusion of the AAC, Guillermo Cabana, Eng. and the President of the TC 2.1 PIARC, Mr. Jacques Ehrlich. After that, the architect Graciela Oporto, Secretary of Planning of Public Investment in Argentina, spoke about the territorial strategic plan, Julio Ortiz Andino, Eng., first delegate for Argentina on

the objectives of the PIARC and Fernando Abrate, Eng., Planning Manager of the National Roads Administration, on the current status of roads and future projects including ITS.

The seminar was divided into 6 sessions, covering various topics such as urban traffic, lanes and roadways management, information to users, use of public space, design of transport infrastructure, multimodality, deployment, interoperability (in a interesting roundtable discussion with more than 10 experts) and evaluation of ITS projects, sustainable urban mobility, connected car and others.

In the closing ceremony, Guillermo Cabana, Eng. (AAC) and the chairman of the Technical Committee 2.2: Mr. Andre Bròtò, Eng. gave the closing addresses.

During the seminar, technical visits to the Urban Traffic Control Centre of the Buenos Aires City, to the Metrobus Circuit, to the Terminal for Private Transport ("Combis") and to the Urban Highways Control Centre (AUSA) were made.

The following presentations were made by TC21 members:

- Using Variable Messages Signs, Alexis Bacelar (France),
- Roads Operation (Frn), Emmanuelle Frénéat (France),
- Switzerland Highway Management, Heinz Suter (Switzerland),
- Efforts at Multimodality, Markus Meisner (Australia),
- Integration of online information using TCIP protocol, Lise Filion (Canada Quebec),
- Congestion Charging in Singapore, Kian Keong Chin (Singapore),
- Future ITS deployment and projects evaluation, Daniel Russomanno (Argentina),
- Solution for public transport, Andreas Rau (Germany, Singapore),
- Connected Vehicle, Jacques Ehrlich (France),
- Application of new information system and technologies to road management & control, Pierluigi De Marinis (Italia).

Just few case studies were selected for presentation, so in order to give the chance to let people know about new challenges and technologies related to road network management and ITS, TC members decided to organise a poster session. 12 posters from several Countries were successfully presented.

- ROAD CONDITIONS SERVICE FOR FINNISH MAIN ROAD NETWORK, Petteri Portaankorva (Finland)
- INTEGRATED APPLICATIONS, Heinz Suter (Switzerland)
- SYSTEM ARCHITECTURE FOR THE FUTURE, Heinz Suter (Switzerland)
- HEAVY GOODS TRAFFIC MANAGEMENT, Heinz Suter (Switzerland)
- TRAFFIC MANAGEMENT SWITZERLAND, Heinz Suter (Switzerland)
- ELECTROMOBILITY-BASED LAND FREIGHT TRANSPORT IN SINGAPORE, Fritz Busch, Andreas Rau, (Germany, Singapore)
- SAFE AND INTELLIGENT MOBILITYTEST FIELD IN GERMANY, Fritz Busch (Germany)
- ANAS ROAD MANAGEMENT TOOL, Michel Adiletta, Pierluigi De Marinis (Italia)
- SCORE@F : FRENCH PROJECT FOR COOPERATIVE SYSTEM (3 posters), Jacques Ehrlich, (France)
- DEDICATED BUS LANE ON A 48 MOTORWAY in GRENOBLE, Mansuy, Belloche, Bacelar (France)
- VAI+ - VIABILITA ANAS INTEGRATA, Michel Adiletta, Pierluigi De Marinis (Italia)
- UTILITY-BASED URBAN TRAFFIC CONTROL SYSTEM, Xiaodong Liu (Sinagpore)

5.2. 2nd seminar: International Seminar on Disaster Prevention and Mitigation, Technologies and Inputs from ITS in Network Operations.

Seminar Minutes written by Mr. Yukio Adachi and Mr. Keiichi Tamura (PAIRC TC1.5) *The International Seminar on Disaster Prevention and Mitigation Technologies and Inputs from ITS in Network Operations was held at the Shaanxi Hotel, Xi'an, China, on November 12-14, 2014. This seminar was jointly organized by the World Road Association (PIARC) Technical Committee (TC) 1.5 on Risk Management, PIARC TC2.1 on Road Network Operation, Key Laboratory of Cold and Arid Regions Highway Engineering, Key Laboratory of Shaanxi Provincial Highway Traffic Disaster Prevention and Mitigation, and Shaanxi Provincial Highway Institute, and was supported by CCCC First Highway Consultants Co., Ltd. (FHCC).*

The two-day seminar consisted of four technical sessions and a technical exhibition with a large number of participants including experts from governments, academia and the private sector both from China and abroad.

During the opening session, a welcome address was delivered by Mr. Mingxian WU, President of FHCC, which was followed by the opening remarks by Prof. Keiichi TAMURA, Chair of TC 1.5 and Dr. Jacques EHRLICH, Chair of TC2.1. They expressed cordial appreciation to the Chinese colleagues for organizing this seminar, and stated the importance of risk management and efficient road operations supported by ITS technologies. Lastly, Dr. Yong Joo CHO, Executive Vice-Chairperson of Organizing Committee of the 25th World Road Congress (WRC), extended a warm welcome to the 25th WRC in Seoul, Korea, in his remarks.

The first session was composed of keynote presentations. They covered various fields of risk and emergency management methodologies and applications, such as risk analysis and mitigation measures against mountain road disasters, construction and application of monitoring and emergency response system in the national highway network of China, highway health and safety monitoring system in cold and high altitude areas, and risk management for storms in relation to climate change.

The other three sessions consisted of practical presentations on road risk and emergency management and ITS applications. The second session mainly focused on risk management for roads and traffic operations under natural and man-made hazards. Presentations in the third session discussed emergency management for roads and traffic operations under natural and man-made hazards. The fourth session featured inputs from ITS in network operations.

Lastly, in the closing session, Mr. Zuo WANG, Deputy General Manager of FHCC, stated the importance of risk management and ITS technology in the road engineering practice. He also mentioned the importance of seminar to share the most updated knowledge and experience on the tools, methodologies and technologies of common interests with international colleagues. The seminar was successfully concluded with a big applause of the audience.

On the last day of the seminar, the participants visited the monitoring center of Zhongnanshan tunnel, which is the world's second longest road tunnel. They were very impressed by the safety operation techniques and the various emergency management measures adopted there.

The following presentations were made by TC21 members:

- Watering damage in Mali, Mary Traoré (Mali)
- ANAS network operations: an ITS framework for monitoring and control, De MARINIS, Pierluigi (Italia)
- Probe vehicle: a low cost innovative and promising solution for road networks monitoring, Jacques Ehrlich (France)
- ITS behind the quality of traffic flow in winter in Finland (France)

5.3. Survey “Use of social network and mobile application”

Work Group members decided to conduct a survey (20 questions, available at Appendix 2) in order to examine in depth the Topic 2.1.1.3 about the use of social network and mobile applications aimed at exchanging information with road users.

The survey covered the majority of countries and road administration participating to PIARC TC 2.1 (18 international companies which took part in the survey).

In the following are underlined the main evidences arising:

- the largest number of information conveyed to road users regards the road network (maintenance, works, ordinance etc.) and real time traffic;
- sharing information with users has a great impact on road administration performances. It allows a better control of traffic flows and congestions (13/18 positive answers) and improvement on levels of service provides (12/18 positive answers). Also collecting information from users enhance further improvements in road network management, and 39% of members use phone calls for this purposes;
- 50% of Road Administrations interviewed shared information related to road network almost real time;
- in the last few years social networks and mobile applications have been protagonist of a terrific rising. Tools like Facebook or Twitter, rather than the VAI+ application developed by ANAS, have taken a fundamental role in information exchange with users. Despite their desiderata and expected road users needs only 7 road agencies out of 18 use social network, while most of them (10/18) have developed a mobile application to these purposes.

5.4. Survey on Floating Car Data application maturity.

Topic 2.1.3.3 describes various application and services based on Floating Car Data. Some of them could be deployed right now, others will be deployed in a near or a far future. We decided to assign to each application a maturity index between 1 and 3 : M=1 : application deployed right now, M=2 : possible deployment within 5 years, M=3 : possible deployment past 5 years. In order to rate each application we submitted a questionnaire to experts from the committee or external to it. Fifteen answers were collected and opinions were consistent for most applications.

5.5. Communication to congress

- *Déploiement des ITS dans les pays en développement : l'exemple du projet TRACKING au Mali*, Mary TRAORE, Jacques EHRlich, Abdoulaye DICKO, Maley DANFAKHA, *Rencontre de la Mobilité Intelligente, Congrès ATEC-ITS, 27-28 janvier 2015, France*
- *Road Management and operations services supported by ITS - The experience of ANAS S.p.A. (The Italian National Road Authority)*, Pierluigi DE MARINIS, Michele ADILETTA, Valentina GALASSO, ANAS S.p.A. Italy;

- *A new solution for multimodal network operations: ANAS goes app - The MOS Mobile System*, Valentina GALASSO, Pierluigi DE MARINIS, Michele ADILETTA, Elisabetta MARCOVALDI, ANAS S.p.A. Italy;
- *Management of road assets seeking for the best trade-off between efficiency and budget constraints*, Pierluigi DE MARINIS, Michele ADILETTA, Valentina GALASSO, ANAS S.p.A. Italy.

5.6. Publications

- *Supporting road management and operations thoughts ITS – the experience of ANAS S.p.A (Italy)*, De Marinis Pierluigi, Adiletta Michele, *Routes-Road 2015*, Nr. 365

6. APPENDICES

6.1. Appendix 1 : Cases studies abstract

Nr.	Summary
211.x	RMT - Road Management Tool, Michele Adiletta et Pierluigi De Marinis, Italia Since 2011, one of the major challenges ANAS is facing, concerns the introduction of Intelligent Transport Systems in order to improve mobility of people and goods along the network, monitor and control road network status and traffic flows and increase response in emergency situations. To these purposes a new unique system has been designed and deployed: the ANAS Road Management Tool.
211.x	VAI + - Viabilità ANAS Integrata, Michele Adiletta et Pierluigi De Marinis, Italia How can a road administration identify, classify and better understand road users' needs and expectations? How can road users' satisfaction be increased? The introduction of new smart systems to provide and exchange information with users can be a good answer. In order to satisfy these needs ANAS designed and developed the VAI + application: a mobile platform where both users and road administrations can upload and share information.
211.x	European : project TROPIC, Alexis Bacelar, France The objective of European TROPIC project was to harmonize European VMS use, in particular on the trans-European road network (TERN). To do it, Tropic project studied numerous technical, practical, institutional, organizational, economic and legal aspects connected to VMS implementation. In the end, VMS harmonization improved, but is still going on with the introduction of variable signalization in Vienna convention on road signs and signals.
211.x	Transfer of heavy goods transport from road to rail; Heinz Suter, Switzerland. The Gotthard route is Switzerland's most important road link through the Alps. Approximately 80 percent of goods transported by road through the Alps in Switzerland are carried via this route. The Gotthard route is also of great importance for passenger transport. The Gotthard road tunnel has to undergo extensive renovation, in the course of which it will be closed for 3 years. Two options for the renovation are to be proposed to the Swiss population and voted on in a referendum: Construction of a new tunnel tube or redirect the traffic to other routes through the Alps and the transfer to other forms of transport (railway). The case study shows the solution to carriage heavy goods by rail through the new 50-kilometre Gotthard base (railway) tunnel.
211.x	Integrated Applications; Heinz Suter, Switzerland. Since 2008, the Swiss traffic management centre has been working with basic tools. This project focuses on the provision and operation of applications that can be used by the operators of the Swiss traffic management centre and other players at the cantonal control centres and the regional units and regional offices of the Swiss Federal Roads Office (FEDRO) as tools for the daily operation of the Swiss traffic management system. The main objectives of the project are as follows: Creation of a completely new operating environment, fully replace the existing temporary individual solutions. Introduction of uniform systems for all involved entities.
211.x	Interoperability between highway operators in Argentina, Daniel Russomanno, Argentina In Argentina, the decision makers of the roads infrastructure are working with the concept of technical, administrative and service / product interoperability in the Electronic Toll Collection systems of the all country. They are using now products with multiprotocols of communications, open or closed, owners or public, with a frequency of 915MHz. The challenge is to make political,

	business and technological agreements not only between governments but also between private concessionaires and other stakeholders to ensure an effective interoperable intelligent transport systems by setting objectives, specific, ambitious, achievable, with predetermined periods and performance analysis with innovative and creative indicators keys performance.
211.x	ITSDEPLOY, Daniel Russomanno, Argentina Buenos Aires City has some traffic control centres and a mobility plan with ITS. The promotion of the deployment of ITS here is an important challenge to improve the indicators of roads safety, mobility, environment, energy consumption, congestion, users information and so on. The report will show the different systems, SWOT analysis, risks, projects and actions/measures of all of stakeholders to deploy the ITS in effective way.
211.x	Toll Operations in the US, James Pol, USA This case considers the deployment of Electronic Toll Collection (ETC) throughout the US, where deployment of ETC technology now stands at 99% of all toll plazas and at 93% of all toll lanes. Open road tolling is rapidly expanding for various regions in the US. Most toll agencies apply proprietary systems for delivering ETC functionality. To overcome interoperability issues, agencies apply ETC readers with the capability to read in multiple formats. No regulation currently exists to require a toll agency to apply a specific standard. The interoperability is driven by market factors such as customer response.
211.x	UK Interfaces in road systems – Lucy Wickham The purpose of the Highways Agency (HA) in England is to keep road traffic moving without unplanned incident or delay. It achieves this through the effective provision of three core activities: Operate; Maintain and Improve. These core activities are set against wider government priorities which set a context for service delivery - recognition that insufficient capacity, recurrent congestion caused by pinch points and unreliable journey times can all act to constrain economic growth. This case study examines the drivers and influences that are key to keeping the country moving as well as supporting and sustaining economic growth
212.x	Title: Intelligent Speed Adaptation – Effects and challenges, Jonas Sundberg The objective of Intelligent Speed Adaptation (ISA) is to support the driver to comply with speed limits on the road network. ISA is based on the capacity of the vehicle to know the prevailing speed limit Full-scale introduction of ISA is estimated to bring a reduction of accidents in the order of 10-30% and also bring a reduction to severity of accidents when they occur. ISA will also bring a change to driver behavior (smoothing and reducing top speed) which is estimated to bring 4-8% reduction of fuel consumption. As Speed Assist, including ISA, has been introduced in the EuroNCAP star-marking scheme and the development of Cooperative Systems evolves, ISA can be expected to face a wide introduction in a few years.
212.x	M42 Active Traffic Management Pilot, Ian Patey, England The Active Traffic Management Pilot on the M42 motorway in England demonstrated that the hard shoulder could be used safely and effectively as an additional traffic lane when required for congestion and incident management. A comprehensive business case was developed to secure the investment; this was followed by a comprehensive monitoring and benefits realisation process. The success of eth Pilot led to the development of a National programme of managed, smart motorways.
212.x	ITS infrastructure deployment on South Africa's National Roads – Freeway Management Systems, Kersen Naidoo, South Africa In the context of developing countries, the case study focuses on the primary as well as ancillary contributory factors that led to the deployment of ITS infrastructure on national roads in South Africa. Following an initial pilot phase deployment, the success factors, areas requiring improvement and 'lessons learned' were ascertained and informed the principles and concepts of the subsequent deployments. Features of the recent ITS infrastructure deployments include inter alia, an innovative contracting model, robust performance monitoring and the use of social media.
212.x	E-BEMI: Blueprint TRACKING, Mary Traoré, Mali The blueprint TRACKING objectives are to track vehicles in real time on their paths, to locate them geographically, to be aware of vehicles shifts in order to cover the importation and exportation of products for social and economy development of Mali, the improvement of the security of people and goods, the reducing travel time, the efficient infrastructure protection, the data management, etc. The technology consist to install sign (GPS) in the vehicle, to put in the wall the computer equipment an integrated system, which work with a software called "E-BEMI". After the successful conclusion of the pilot phase, the blueprint is, now, in deployment for cover national and regional areas.
212.x	Weather Controlled VMS in Finland, Petteri Portaankorva, Finland Climate in Finland has great contrasts; cold winters and warm summers. In Finland highest speed limits are reduced during winter and dark season by fixed speed limit signs or by variable message

	signs controlled by prevailing weather and road conditions. The main goal of these traffic management systems is to reduce the amount and severity of weather and road conditions related accidents but also allow using higher speed limits and improving traffic fluency during good road conditions in winter.
212.x	Road Conditions Service in Finland, Petteri Portaankorva, Finland Snowy winter in Finland is long. The ground is typically covered with permanent snow about three months in Southern Finland to seven months in the north. Road Conditions Service is based on road weather and weather data and it is produced automatically for 10 000 km's of Finnish main road network. The service includes real-time situation of road conditions and forecasts for next 2, 4, 6 and 12 hours during wintertime from mid-September to mid-May for three interfaces in three languages.
212.X	Towards deployment of LAVIA (ISA) in France, Jacques Ehrich, France LAVIA is speed limiter which automatically sets the vehicle's highest speed limit at the speed limit in force at its location. LAVIA was tested in France (2001-2006) in naturalistic driving condition according to three operating modes: advisory, active voluntary and active mandatory. From measured speed reduction due to LAVIA usage it was possible to estimate a reduction of fatalities up to 250/y. Following the LAVIA project several European initiative (SPEED ALERT, ACTMAP, ROSATTE etc) aim to define a shared definition of ISA and standards. Despite the fact that technology can be considered as mature, LAVIA system is not yet deployed in France : main obstacles are : speed database construction/updating, lack of decision at European level, lobbies pressure, weak business model etc. However, thanks to EuroNcap that has demonstrated its efficiency to stimulated passive safety, ISA systems revival is expected in a near future
212.x	Benefits Costs Deployment Lessons Learned, James Poi, USA The United States Department of Transportation (USDOT) maintains a database of the benefits, costs, deployment levels, and lessons learned regarding ITS. Analysis of the benefits, costs, and lessons learned summaries has led to a number of observations about the types of benefits attributed to ITS technologies, the range of installation and operating costs (including analysis by geographic area), and important lessons learned when implementing ITS technologies.
213.x	Title : Smartway (ITS Spot Service), Yamada H., Japan Roads are now transforming from a conventional space for movement into a kind of cyberspace where various information is assembled, handled, exchanged and disseminated. One of technologies that support Smartway is ITS spots. They are roadside communication units which use 5.8 GHz DSRC. They have been installed on as many as 1,600 sites in Japan and various services are now provided.
213.x	German Field Operational Test for c2x Applications – sim-TD, F. Busch, Germany The simTD research project is shaping tomorrow's safe and intelligent mobility through researching and testing car-to-x communication and its applications. For this purpose realistic traffic scenarios were addressed in a large-scale test field infrastructure around the Hessian city of Frankfurt am Main. Another important focus of the project was to identify and evaluate sustainable organization models for a successful market launch. Tests for evaluation of technical performances, impact on driver behaviors and traffic was conducted on driving simulators, open road and extensive computer-based traffic simulation.
213.x	URBAN-Project: Cooperative Systems for Urban Environments, F. Busch, Germany The aims of the initiative are to increase the traffic safety in urban areas as well as to facilitate economical, energy efficient and low emission transportation. The research is divided into three target areas : i) cognitive assistance to support drivers in complex urban traffic by providing a panoramic vision, ii) networked traffic system, using new I&C-technologies such as GPS/Galileo, UMTS/LTE and V2X-communication to enable novel methods for cooperative urban traffic management, iii) human factors in traffic to understand and model interaction and behavior of road users in traffic. The goal is to develop a safer, more efficient, and less taxing urban driving experience for all road users.
213.x	V2V and V2I communication in SCORE@F project, J. Ehrlich, France The main goals of the SCORE@F project is to prepare the deployment of safety, mobility and comfort services based on information exchange between vehicles, road side unit (RSU), nomadic devices and traffic management centers. The project includes various activities supported by 22 partners : end-user services specification, system architecture definition, software development, system deployment on test tracks and open roads, test and evaluation of technical performance, usage, utility, acceptance by drivers and business model analysis. Uses cases cover both safety, mobility and comfort services. Evaluation in two steps was conducted on driving simulator and open road : a first step over a reference road and a second step in naturalistic conditions.
213.x	SMART Highway Research and Development Project, Seungjun Lee, South Korea A SMART Highway is defined as a multifunctional road on which smart technology is applied for

	future users in terms of safety and mobility. This case study introduces the SMART Highway R&D Project which contains five research fields; Establishment of a master plan for SMART Highway, Road construction technology considering materials, maintenance, safety, and driving environment, Traffic operation technology based on the road-communication environment, Automobile technology based on the vehicle-road environment, and Construction and operation of a test bed.
213.x	Autolib' : a public self-service plan with electric vehicles deployed at a large scale, Patrick Le Coeur, Jacques Ehrlich, France Autolib' is a new mobility offer of self-service electric cars in Paris and surrounding area. An available car– among 3000 vehicles and 700 station -can be collected from any rental station and returned to any other rental station. Autolib' offers also offer the possibility to use the station to recharge personal electric vehicles. A structure - called "Syndicat Mixte Autolib'" (SMA : Autolib' Joined association) - has piloted the project and contributed to its fast deployment, along with Bolloré (The operator) and the different local authorities involved. By May 2013, Autolib' had more than 75,000 registered subscribers, of which 30,000 had an annual subscription. Autolib' vehicles had been driven a cumulative total of 15,000,000 km since its launch in 2011.
213.X	Fifth Generation Road (R5G), Nicolas Hautière, Jacques Ehrlich, France To avoid compromising the ability of future generations to meet their mobility needs, the roads need to be involved in the challenge of energy transition and sustainable development. In synergy with the European program "Forever Open Road" (FOR), R5G is based on three key elements: i) the adaptable road to respond in a flexible manner to changes in the road users' demands and constraints, ii) the automated road focuses on the full integration of roadside and vehicle intelligence based on Communication Technologies (ICT) applications on the user, iii) the climate change resilient road focuses on ensuring adequate service levels of the road network under extreme weather conditions. At IFSTTAR (France) R5G comes on a pragmatic approach which consists in grouping on four demonstrators already available components and / or sub-systems and then to make them evolving.
213.x	Smart City, H. Yamada, Japan ITS technologies play an important role in expanding the use of EVs. In the city of Yokohama, Japan, EV sharing has started in 2010 in the Kanazawa industrial area and small two-passenger EVs of Nissan Make have been employed. The use of EVs and the development of the Smart City are expected to contribute to preventing global climate changes and making our cities smarter.
213.x	Deployment of Three Types of Electric Bus in Korea, KyoOk Kim, South Korea In Korea, three different types of electric buses (EB) have been developed since 2009 and have been deployed in different cities : Electric bus of plug-in type, wireless electric bus and battery-swapping type electric bus. Electric bus of plugin-in type uses a LiOn batteries which takes 200 min for charging. Max speed is 100 km/h and autonomy is 120 km. 15 buses were demonstrated in Seoul. Wireless electric buses uses (OLEV) the Shaped Magnetic Field Resonance (SMFIR) technology that allows 85% of the energy to be transferred from under-road power cables to a pickup device installed under the vehicle. This type of bus has been demonstrated on a 24 km route and one QCM. In the future Seoul City will run 400 EB within end of 2014 and 3,500 EB will be introduced in Korea within 2020.
213.x	Using an electric bus in winter conditions, Odile Beland, Canada-Quebec Tests on electric buses behavior in winter conditions have been made by the Société de transport de Laval (Québec), Beneficial in terms of emissions of greenhouse gases, electric bus has several limitations: autonomy, recharge areas, acquisition and infrastructure costs. Savings can be made on fuel, but winter conditions can affect performance. Tests conducted allowed to make interesting observations.
213.x	ICM Dallas, James Pol, USA Adding travel lanes on freeways and arterials can relieve congested roadways, but this relief is astoundingly temporary. The vision of Integrated Corridor Management (ICM) is that metropolitan areas will realize significant improvements in the efficient movement of people and goods through aggressive and proactive integration of existing infrastructure along major transportation corridors. ICM will integrate the regional systems and operations along the US-75 corridor using a decentralized approach. Travelers will have access to real-time information about traffic and travel times, public transit, and parking availability through wireless and web-based alerts as well as dynamic message signs on the roads to help them plan their routes, and make adjustments as needed in response to changing conditions.
213.x	ICM San Diego, James Pol, USA The goals of the San Diego Integrated Corridor Management Demonstration are improved accessibility and mobility options for corridor travelers, enhanced safety through multimodal coordination, a corridor-wide perspective to resolve problems, and coordination to holistically

	manage the corridor. A Decision Support System (DSS) will utilize incoming monitoring data to assess conditions, forecast conditions up to 60 minutes in the future. Enhancements are being made to the Intermodal Transportation Management System (IMTMS) regional information exchange network, which provides information across the agencies that manage transit, arterial roadway, and freeways
213.x	<p>2.1.3 Safety Pilot, James Pol, USA</p> <p>The Connected Vehicle Safety Pilot Program is part of a major scientific research program run jointly by the U.S. Department of Transportation (DOT) and its research and development partners in private industry. The Safety Pilot is designed to determine the effectiveness of these safety applications at reducing crashes and to show how real-world drivers will respond to these safety applications in their vehicles. The test will include many vehicles with vehicle awareness devices, others with integrated safety systems, and others that use aftermarket safety devices to communicate with surrounding vehicles.</p>
	<p>ITS in Singapore, K.K. Chin, Singapore</p> <p>Singapore relies on various Intelligent Transport Systems (ITS) to keep traffic flowing on its road network. Integrated under a common platform called i-transport, it enables more effective management from the control centre. It also enables the dissemination of reliable traffic information via various channels to road users. Continuous improvements in ITS are envisaged to further enhance road network operations.</p>
	<p>Congestion Charging in Singapore, K. K Chin, Singapore</p> <p>The limited land space and hence, limited roads in Singapore meant that traffic demand management is an important tool to keep traffic flowing. The current congestion charging scheme or ERP (Electronic Road Pricing) is a DSRC-based system to facilitate deduction of fees from in-vehicle electronic units with rechargeable stored-value cards. It has been effective in keeping traffic speeds respectable since it implemented in 1998.</p>
	<p>Québec-Ontario Smart Corridor Concept of Operations, Lise Filion, Canada-Québec</p> <p>Transport Canada, with Quebec and Ontario ministry of transport, has undertaken development of a Smart Corridor Concept of Operations. Concept was developed through a participatory process with stakeholders. Based on Canadian ITS Architecture, different scenarios were defined to reflect current and future operations processes. Study delivered an architecture for a smart corridor that will facilitate the transport of goods in the territory and thus support economy growth</p>
	<p>Integrating real-time service status information among public transport organising authorities via the TCIP standard, Lise Filion, Canada-Québec</p> <p>Quebec « Agence métropolitaine de transport (AMT) » conducted a pilot project regarding integration of real-time information on transfer points between agencies, linking Real-Time Passenger Information Systems of different operators. The pilot project demonstrated that TCIP standard can be used to obtain full cooperation from organizing authorities and use different layered softwares to provide useful informations to travelers</p>
	<p>Quebec 511: Comparative study on best practices regarding traveller information services, Lise Filion, Canada-Québec</p> <p>Ministère des Transports du Québec (MTQ) [Quebec ministry of transport] and the Ville de Montréal [City of Montreal] tasked l'École nationale de l'administration publique (ENAP) [National school of public administration] with carrying out a comparative study of 511-type traveler information services. Analysis covered services offered by 6 North American administrations and revealed Québec 511 being favorably positioned. Relevant recommendations have led to development of a vision and a strategic plan as well as integrated governance of the traveler information service in Quebec</p>
211.x	Interchange Ramp Terminals, Jorge Felizia, Argentina
211.x	ITS introduction at Philippine, Francois Bienvenue, France
211.x	<p>Advanced and Cooperative Traffic Management on Hessian Roads, Fritz Busch, German</p> <p>Hessian Road and Transport authority (Hessen-Mobil) is implementing and operating a set of advanced and cooperative transport management measures in a combined approach. The overarching goal is to reduce congestion times drastically with the ultimate target of zero congestion within the complete motorway network. 3 areas are addressed: Traffic management, Mobility Services, Future Technologies. Measure include temporary use of hard shoulders, dynamic localization of maintenance works, variable message signs including traffic reports, advanced rule-based section control, information and navigation advice, dynamic truck parking systems, incident and road works management. C2X-based solutions are core in the area, where also the European ITS corridor Rotterdam-Vienna will cross.</p>
211.x	<p>Private/public operators interaction, Fritz Busch, Germany</p> <p>Free State of Bavaria was one of the first regions in Germany to introduce a public-private partnership service for inter-modal travel and transport services. While the public side erected the</p>

	<p>technical systems at the beginning and also owns them, the private partners are obliged to operate those systems during the operational stage, which runs at least until 2015. Offered services are current and forecast traffic state on motorways including road works and incidents, routing with different transport modes, car sharing, detailed tourist and bike information, traffic webcams, events. The service is available at www.bayerninfo.de in German and English language.</p>
211.x	<p>Toll System Interoperability – Irish approach and and comparison with other models, Emmanuelle Freneat, France</p> <p>Toll interoperability usually translates for the road user into the “One” approach: one account, one on-board unit, one bill. Besides technical compatibility of systems and organization of data exchanges which are a pre-requisite, challenge usually lies in setting up the appropriate cooperation framework between various players, including agreement on commercial principles. Different approaches have been followed in various environments (Ireland, Greece, France, Australia), either centrally managed (typically via an interoperability platform based on a central clearing house) or distributed between toll chargers (pure peer-to-peer).</p>
211.x	<p>Operating environments: Implementation for the road network of the Region of Brussels-Capital, Alain Broes, Belgium</p> <p>This case study relates to a method for determining the ITS services which we want to deploy on a certain network like a city, a region, a country or even roads passing through several countries. This method starts from the existing situation and helps us to determine for each section of the network the services we want to implement in each section and with what level of service. So, the goal is that the whole deployment of ITS is consistent with this vision and reached at a fixed time horizon.</p>
211.x	<p>VICS – Vehicle Information and Communication System, H. Yamada, Japan</p> <p>VICS is a telecommunication system that provides auto drivers with traffic information, such as congestion, traffic regulation, road works etc. VICS helps expand the horizon of drivers greatly. In addition, it contributes to the mitigation of traffic congestion and realizes smoother and less pollutive traffic. After the Great East Japan Earthquake occurred on March 11, 2011, it was found out that the information of passable roads is quite valuable in transporting relief goods as well as for saving lives.</p>
211.x	<p>Traffic and safety messages broadcast to motorists : the French Motorway Radio scheme, Emmanuelle Freneat, France</p> <p>On the French motorways network, near real-time traffic and safety messages are broadcasted to motorists through a single nationwide and dedicated radio frequency. Depending on the concessionaires two main approaches have been adopted for broadcasting: private motorway radio, or partnership with a local radio especially on low traffic motorway sections where there is no justification for a dedicated studio. In any case, information management and communication with the motorway radio is undertaken by the motorway operator through a central traffic control room.</p>
212.x	<p>Central Business District Transport Plan, Active Traffic ..., Jeremy Millar, Australia</p>
212.x	<p>CONDUITS – Key Performance Indicators for ITS, Fritz Busch, German</p> <p>The European project CONDUITS determined a set of key performance indicators which describe the efficiency of ITS measures in a city or region. The purpose in doing so was to provide a standardized set of KPI that enable cities to monitor and assess their investments in ITS on the basis of a coherent set of indicators. The CONDUITS KPI-set addresses 4 areas of transport policy: traffic efficiency, traffic safety, social inclusion and land use, pollution. The KPIs were developed in co-operation with a board of practitioners forming a city pool of over 30 municipal authorities from different EU countries, Turkey and Israel. The process took place under the umbrella of the European city network POLIS.</p>
213.x	<p>TUM Creat resource center for electromobility, Fritz Busch, Germany</p> <p>The TUM CREATE resource center was founded in 2010, starting research operation in 2011. It is funded by Singapore’s National Research Foundation (NRF) and is part of the Campus for Research Excellence And Technological Enterprise (CREATE). TUM CREATE is focusing on electro mobility research for tropical megacities. This includes research in the areas of electrochemistry, electric vehicle batteries, embedded systems, air conditioning, power grid and transportation system simulation, concepts for charging infrastructure and power grid and electro mobility concepts for passengers and freight. One of its results is the development of a specialized electric taxi for megacities (EVA). The program’s first phase is ending in 2016.</p>
213.x	<p>URBAN-Project: Cooperative Systems for Urban Environments, Fritz Busch, Germany</p> <p>The initiative addresses urban areas and develops and tests new cooperative systems and solutions to facilitate economical, energy efficient and low emission transportation. The activities are divided into three areas : i) cognitive assistance to support drivers in complex urban traffic by providing a panoramic vision, ii) networked traffic system, using new I&C-technologies such as</p>

	GPS/Galileo, UMTS/LTE and V2X-communication to enable novel methods for cooperative urban traffic management, iii) human factors in traffic to understand and model interaction and behavior of road users in traffic. Test sites are the cities of Duesseldorf, Kassel and Braunschweig. The initiative will showcase its final results in autumn 2015.
213.x	German Field Operational Test for c2x Applications – sim-TD, Fritz Busch, Germany In the German field operational test sim-TD various close-to-market in-vehicle and central applications based on cooperative technology (V2V and V2I) were tested in reality and simulation. The field tests took place from July 2012 to December 2012 around the Hessian city of Frankfurt running 120 equipped cars for 6 months in pre-defined and (mostly) controlled tests in real traffic situations. The field experiments were complemented by extensive tests in driving simulators and traffic simulation. Main targets of the FOT were technical feasibility, communication system, effects on traffic and safety, legal and deployment aspects
213.x	V TRAFFIC, Jacques, Ehrlich, France V-TRAFFIC is a French company which provides travel related information based on collection of data coming from million of vehicles and mobile phone in Europe. Upward link (from car to back office) is supported by 2,5G or 3G technology and downward link relies on RDS-TMC or DAB radio communication. After a short description of some technical aspects and the various services that are provided, the paper focuses on aspects that are rarely highlighted: quality control issues which is very important as it determines the users confidence in the information system.

6.2. Appendix 2 : Survey “Use of social network and mobile applications”

Question 1 - Which road agency / road authority do you work for?	
Question 2 - Which country/countries does your company run its business?	
Question 3 - What kind of information does your company / road agency share with users?	
ÿ Real time traffic information (queues, travel time, etc)	ÿ Traffic camera live videos
ÿ Traffic bulletins	ÿ General purpose information
ÿ Weather forecast	ÿ Other, please specify _____
ÿ Road network information (maintenance works, ordinances)	
Question 4 - How sharing and publishing road / traffic information have impacted your company performances?	
ÿ Service level improvement	ÿ Timely and more effective disruption management
ÿ Better understanding of road users needs	ÿ Savings in road network management
ÿ Better control of traffic flow and congestions	ÿ Other, please specify _____
Question 5 - Are the information related to traffic and road condition timely updated and broadcasted to users?	
ÿ Not real time	ÿ Up to 30 min from the event
ÿ Almost real time	ÿ Over 30 min from the event
Question 6 - Does your company / road agency measure the customer satisfaction? If yes, how does it take over and measure it?	
ÿ No, we don't measure the customer satisfaction	ÿ Social media analysis
ÿ Smartphone apps	ÿ Other, please specify _____
ÿ Website survey	
Question 7 - Do you collect information related to road / traffic condition directly from your users? If yes, what kind of tool can they use?	
ÿ No, we don't collect road / traffic condition information	ÿ Phone call
ÿ Smartphone applications	ÿ Sms
ÿ Website	ÿ Other, please specify _____
Question 8 - Does your company / road agency use any social network to share information with the users?	
ÿ No, we don't use any social network to share information with our users	ÿ Google+
ÿ Facebook	ÿ Youtube
ÿ Twitter	ÿ Other, please specify _____
Question 9 - Why did your company / road agency decide to use social network?	
ÿ To broadcast infomobility services to road users	ÿ To promote and broadcast initiatives
ÿ To provide general information regarding road network	ÿ Other, please specify _____
ÿ To receive feedback from road users	
Question 10 - How long have your company / road agency been using social network?	

<input type="checkbox"/> Less than 1 year	<input type="checkbox"/> 3 - 5 years
<input type="checkbox"/> 1 - 3 years	<input type="checkbox"/> more than 5 years
Question 11 - How many followers your social network profile (e.g. Facebook, Twitter, etc.) have?	
<input type="checkbox"/> less than 10.000	<input type="checkbox"/> 30.000 - 50.000
<input type="checkbox"/> 10.000 - 30.000	<input type="checkbox"/> more than 50.000
Question 12 - Which are the benefits coming/expected from the use of social networks?	
<input type="checkbox"/> Improvement of Level of Services	<input type="checkbox"/> Easiness for broadcasting of traffic information
<input type="checkbox"/> Better understanding of road users needs	<input type="checkbox"/> Other, please specify _____
<input type="checkbox"/> Improvement of transparency regarding road network status	
Question 13 - Is your company / road agency planning further developments for social network use?	
Question 14 - Does your company / road agency use any additional communication channel other than social networks?	
<input type="checkbox"/> No, we don't use any additional communication channel	<input type="checkbox"/> Smartphone apps
<input type="checkbox"/> Radio	<input type="checkbox"/> Other, please specify _____
<input type="checkbox"/> Television / Web Television	
Question 15 - Does your company / road agency use any mobile application to share information with the users?	
<input type="checkbox"/> Yes, it does	<input type="checkbox"/> No, it doesn't
Question 16 - How long has your company / road agency been providing mobile apps, if any?	
<input type="checkbox"/> Less than 1 year	<input type="checkbox"/> 3 - 5 years
<input type="checkbox"/> 1 - 3 years	<input type="checkbox"/> More than 5 years
Question 17 - Which operating systems does your mobile app support?	
<input type="checkbox"/> iOS	<input type="checkbox"/> Windows phone
<input type="checkbox"/> Android	<input type="checkbox"/> Other, please specify _____
<input type="checkbox"/> Blackberry	
Question 18 - Is the application free to download? and does the company also provide a more advanced paid version?	
<input type="checkbox"/> Just the free version	<input type="checkbox"/> if both please specify:
<input type="checkbox"/> Both free and paid version	<input type="checkbox"/> which feature characterize the paid version
<input type="checkbox"/> Only paid version	<input type="checkbox"/> how many does it cost your app
Question 19 - How many downloads does your app have?	
<input type="checkbox"/> less than 10.000	<input type="checkbox"/> 30.000 - 50.000
<input type="checkbox"/> 10.000 - 30.000	<input type="checkbox"/> more than 50.000
Question 20 - Is your company / road agency planning further developments on mobile applications? If yes, please specify prospected goals:	

**TECHNICAL COMMITTEE 2.2
IMPROVED MOBILITY IN URBAN AREAS**

2012-2015 ACTIVITY REPORT

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Natalia Tanan, Indonesia

1. INTRODUCTION TO THE STRATEGIC THEME 2

TC 2.2 is in the Strategic Theme "2" focused on "**access and mobility**". The goal of this theme is to encourage the improvement of access and mobility provided to the community and industry by improved road network operation and integration with other transport modes.

The group's chair is André Broto (France), with the help of Robert Freemantle (Australia) and the three secretaries are:

- English-speaking Secretary: Ana Maria Leyton (Canada), then Harlan Miller (USA)
- French-speaking Secretary: François Rambaud (France)
- Spanish-speaking Secretary: Ricardo Eugenio Arredondo Ortiz (Mexico)

The three working group convenors are:

- Working Group 1 "Comparison of strategies for sustainable urban mobility" – Harlan Miller (USA), with the help of André Broto (France) and Akira Endo (Japan).
- Working Group 2 "Design of transport infrastructure for multimodality in urban areas" – François Rambaud (France).
- Working Group 3 "Promotion of walking and cycling¹" – Jean Claude MOUREAU (Belgique), then Lluís Alegre i Valls (Spain).

¹ Called also "active modes"

2. WORK PROGRAMME AND ORGANIZATION

2.1. Plenary meetings

There have been seven plenary meetings held over the course of the four-year term, as follows, with the number of TC 2.2 members attending shown in brackets:

- March 2012: Paris - France (24)
- November 2012: Bologna - Italie (20)
- May 2013: Providence - USA (18)
- November 2013: Buenos Aires - Argentina (18)
- April 2014: Paris - France (15)
- October 2014: Makassar - Indonesie (5)
- April 2015: Barcelona - Spain (12 planed)

All plenary meetings have included case studies presentations by members and all the working group meetings as well. At the plenary meetings, the hosts organised local technical tours, as follows:

- Bologna – visit to the city centre, dedicated to active modes during the whole weekend, with a presentation on this new organisation and its first successful results.



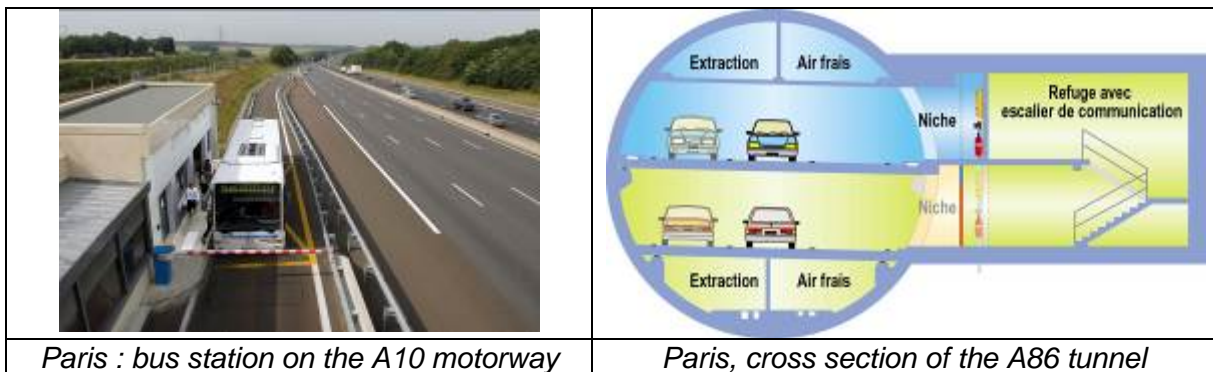
Bologna : the city centre forbidden to the motorist traffic during the weekend

- Providence – visit to the impact of a successful urban transformation project which aim was to move the road ring, in order to improve the city centre mobility. The group also visited a new pedestrian zone.
- Buenos Aires – presentation of the whole mobility plan and BRT program with its first successful results. Visit of the traffic control centre and the emblematic section of the BRT lines, already on service into the largest avenue "9 de julio" in city centre, well connected to the metro lines.



The Metrobus "9 de Julio" in city centre - Buenos Aires

- Paris - presentation of the bicycle sharing system - presentation and visit of the bus station Briss-sous-Forge on the A10 motorway, presentation and visit of the Duplex Project A86.



- Barcelona - a visit of a new HOV lane on a motorway is planned.

Case studies or ongoing projects have been requested from each member, based on the 3 sub-group items and focus on innovative approaches (governance, process, funding, technology, etc.). There were all presented during the plenary meeting. Some of them have been kept as case study description.

All these presentations, with minutes of these plenary meetings are available into this "ftp" link, until end of 2015¹ :

- Ø To access at these files , "reading, and down loading" with IE, Firefox, etc :
- Ø <ftp://act-cost:act-cost@certu.info/>
- Ø To access with Filezilla or other similar tool "ftp":
- Ø Host : certu.info
- Ø Identifiant : act-cost
- Ø password : act-cost

2.2. Working group 1

Working Group 1 called "Comparison of strategies for sustainable urban mobility", had these strategies, as follows:

¹ In fact, unfortunately we could not use easily the PIARC web site.

- Investigate how the concept of sustainable urban mobility is being translated into strategies and plans for actions in large cities.
- Benchmark the approaches used for decision making, and the methods and tools for assessing the results.
- Review the key aspects of urban transportation strategies of major metropolitan areas and cities and find out what kind of indicators are used to express sustainable mobility through surveys and case studies.
- Focus on sustainability concept - encompass social, economic and environmental factors.

The survey consisted to go further the work done during the previous strategic plan, to collect additional data of population, density, mobility, and master plans from metropolitan regions and their cities.

Finally, using 9 case studies, the working group investigated the relationship between the density (population and employment) transportation modes networks, and mobility results.

The case studies were:

- Ø Tokyo Metropolitan Region,
- Ø Seoul region
- Ø Madrid region
- Ø Paris Region,
- Ø Barcelona
- Ø Vienna
- Ø Nagoya
- Ø Helsinki Region,
- Ø Melbourne

Key figures and results were summarized into the introductory report ; the final report is still under finalisation.

2.3. Working group 2

Working Group 2 called "Design of transport infrastructure for multimodality in urban areas" had these strategies, as follows:

- Investigate the sustainability of the recent and increasing trend to dedicate lanes at the most capacitive road systems, based on buses, coaches (BRT systems) or carpooling (HOV, HOT).
- Identify and benchmark the different approaches and innovations implemented in comparison with rail technologies.
- Review the key aspects and the potential market of these road urban transportation modes, without forgotten the ability to be "intermodal" within the whole mobility network.
- Review obviously the importance of the local context, geographical, social and economical context.
- On an other hand, investigate the evolution of motorcycles and scooters, their advantages and drawbacks regarding safety and road management constraints.

Three surveys have been launched to collect the feedbacks of the most recent and innovative case studies that will come from all members: one regarding the BRT or

capacitive and innovative bus projects, one regarding HOV and HOT projects, the last regarding the use of motorcycle and scooters.

The case studies that have been summarised, and available into a file, are:

- From USA :
 - Ø The project "HOT", state Virginia - 2012
 - Ø Houston HOT networks, Texas (2012 / 2013)
 - Ø MnPass Express Lanes - Minneapolis, Minnesota, USA
- From France :
 - Ø Busses on hard shoulder on the A48 (Grenoble)
 - Ø Trends in Île de France (Paris region)
- From Korea :
 - Ø The HOV trends in Korea
 - Ø The BRT program in City of Seoul
- From Spain :
 - Ø Madrid : the Bus VAO implemented in the A9 motorway (busses and carpooling)
 - Ø Barcelona : new interurban services, C-31, C-58 on motorways
- From Australia : the BRT trends, and a focus on the PT program in Melbourne.
- From Japan :
 - Ø Different BRT types
 - Ø Nagoya City, the BRT lines
- From Argentina : in Buenos Aires, the development of the BRT program called "Metrobus"
- Chile : the BRT program in Santiago

Unfortunately, we could not collect enough materials regarding the 3rd issue "motorcycle", so that we decided to introduce this item into the call of the next PIARC seminar in Seoul. We have received many papers, mostly from Asia, so that we will get much more materials.

The lessons learnt were summarized into the introductory report; the final report is still under finalisation.

2.4. Working group 3

Working Group 3 called "Promotion of walking and cycling" had these strategies, as follows:

- Investigate the evolution of the active modes (walking and cycling) .
- Identify and benchmark the different mobility plans for walking and cycling that begin to exist in several cities.
- Investigate effective and innovative measures taken to promote these modes, walking and cycling, including the design of sustainable neighbourhoods, measures to secure safety for vulnerable users, involvement of NGOs in decision-making, public awareness and empowerment.
- Review the key aspects and the potential market of these road urban modes,
- Review obviously the importance of the local context, geographical, social and economical context.

A survey has been launched to collect the feedbacks of the most recent and innovative case studies that will come from all members.

Working Group 3 undertook a survey, regarding these six areas:

- planning and budgeting for such policies;
- the development of specific infrastructure;
- public participation;
- safety;
- intermodal transport;
- public awareness.

Altogether, there were 27 answers from the corresponding cities. The working group analysed the results and identified some trends and features of successful schemes for walking and cycling. Where measures were comparable between cities, comparisons were made quantitatively, other comparisons were made qualitatively.

Some of the results of the working group were summarised in the introductory report. Final report preparation continues at the time of writing this Activity Report, with the objective to identify some key lessons learnt for decision makers, in charge of sustainable mobility..

3. PRODUCTIONS

3.1. Publications

The whole magazine Routes/Roads n°365 edited in January 2015 has been dedicated to the TC 2.2 issues “improved mobility in urban areas”, with these articles:

- Ø André BROTO : Key mobility challenges facing metropolitan areas - Editorial.
- Ø Dr Takeshi YADJIMA : The Medium-term Strategy to realize Multi-modal Mobility in Tokyo Metropolitan Region (TMR).
- Ø Urs GLOOR : Le concept de transport régional et de design urbain de l'agglomération de Berne (2012) - déclenché par le Projet de territoire Suisse et le Projet d'agglomération.
- Ø Farina OSCAR and Olga VICENTE : Aera Metropolitana de Buenos Aires : transport infrastructures, mobility and modal split.
- Ø Luis ALEGRE I VALLS and Francesc Carbonell : cycling and pedestrian policies in cities and metropolitan areas worldwide.
- Ø François RAMBAUD : the Bus Rapid Transit (BRT): a concept also popular on urban motorways.

In this PIARC magazine, some other articles can be found, from Italy and France.

3.2. Seminars

The whole TC 2.2 participate at several seminars that were linkes with the plenary meetings, such as :

- Ø The Urban Promo 2012 Congress and Exhibition in Bologna, included excellent presentations from academic staff from the University of Bologna covering Analysis of Safety Performance of Traffic Calming Devices in Urban Areas.

- Ø The ITS Argentina seminar in Buenos Aires (Argentina), with the TC 2.1 – November 6 and 7, 2013.



Terminal Obelisco for minibuses

- Ø The AASHTO seminar in Providence.



Providence, regeneration of a district, by moving a highway section.

- Ø The international seminar TRA in Paris (2014), Transport Solutions: from Research to Deployment - Innovate Mobility, Mobilise Innovation!
- Ø The International Seminar in Makassar "Improving Mobility in Urban Areas" organised by the Indonesian Road Development Association in conjunction with PIARC.

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**TECHNICAL COMMITTEE 2.3
FREIGHT TRANSPORT**

2012-2015 ACTIVITY REPORT

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COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

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Bernard Jacob, France
Carlos Santillan, Mexico
Eiichi Taniguchi, Japan
Rikard Engstrom, Sweden
Teresa Adams, United States
Tariq Al Falahi, United Arab Emirates
Yoon-Hyuk Choi, South Korea
Florence Comes, France
Pieter De Winne, Belgium
Bill Gardner, United States
Dave Henry, Canada
Yoshi Imanishi, Japan
Jonathan James, United Arab Emirates
Toril Presttun, Norway
Martin Ruesch, Switzerland
Mohammad Tayyaran, Canada
Ali Traore, Burkina Faso
Achil Yamen, Cameroon

The members listed above attended at least two meetings of Technical Committee 2.3, Freight Transport, and/or provided a substantial contribution to the activities of the Committee.

1. COMMITTEE WORK PROGRAMME

1.1. General

Technical Committee 2.3 was allocated two tasks under its Terms of Reference, in accordance with the *Strategic Plan of the World Road Association – 2012 – 2015*:

- Issue 2.3.1, Freight management.
- Issue 2.3.2, Co-modality for freight transport

In response to its Terms of Reference the Committee produced two technical reports based upon case studies:

- *Framework for citywide road freight transport management*
- *Moving freight transport forward – Green, Smart and Efficient*

The Committee also co-convened two International Seminars in the 2012 – 2015 cycle:

- *Freight Transport*, Montevideo, Uruguay, 28 – 30 October 2013
- *The Transport of Goods by Road in Africa*, Yaounde, Cameroon, 14 – 15 May 2015

To facilitate the work of the Committee, eight meetings (two meetings per year) were planned, supplemented by teleconferences and Webex meetings as required.

The Committee also contributed to the World Road Association quarterly publication, *Routes / Roads*, especially the 2nd Quarter 2013 edition, which focused upon freight transport. It contributed to the Committee on Terminology (CTERM), and will convene a session, Freight Transport, at the World Road Congress in Seoul in November 2015.

2. COMMITTEE STRUCTURE AND KEY APPOINTMENTS

2.1. General

Technical Committee 2.3 was structured as an 'executive' and two Working Groups. The Chair and Secretaries were appointed by the World Road Association prior to the commencement of the 2012 – 2015 cycle, and so were in place prior to the first meeting of the Committee in Paris in March 2012. A leader for each Working Group was agreed by the Committee, and remained in place for the whole cycle.

The Committee also appointed members to the positions of Webmaster and liaison to the Committee on Terminology (CTERM).

2.2. Appointments

Chair: Don Hogben, Australia
English Speaking Secretary: Rick Barber, New Zealand
French Speaking Secretary: Bernard Jacob, France
Spanish Speaking Secretary: Carlos Santillan, Mexico

Working Group 1 Leader: Eiichi Taniguchi, Japan
Working Group 1 Leader: Rikard Engstrom, Sweden

Webmaster: Rick Barber, New Zealand
Assistant Webmaster: Achil Yamen, Cameroon
CTERM representative: Pieter DeWinne, Belgium

International Seminar (Uruguay) coordination: Carlos Santillan, Mexico
International Seminar (Cameroon) coordination: Achil Yamen

All active members and corresponding members were also members of either Working Group 1 or 2 and many also volunteered for other specific tasks, including CTERM tasks, quality control / output review, reviewing World Road Congress abstracts and papers, preparing articles for *Routes / Roads*, and presenting at external events.

3. COMMITTEE MEETINGS

3.1. General

Technical Committee 2.3 met on seven occasions, including the initial meeting in Paris in March 2012. The Committee will hold its final meeting at the World Road Congress in Seoul, South Korea in November 2015.

3.2. List of Meetings

The Committee held meetings as follows:

- Paris, France, 20 – 22 March 2012
- Stockholm, Sweden, 20 – 21 September 2012
- Chicago, United States, 23 – 24 May 2013
- Montevideo, Uruguay, 25 – 26 October 2013
- Basel, Switzerland, 13 – 14 May 2014
- Abu Dhabi, United Arab Emirates, 18 – 19 November 2014
- Paris, France, 11 – 12 May 2015

The effort and generosity of members and their organisations who hosted meetings, and in some cases technical visits, is acknowledged.

3.3. Technical Visits

In conjunction with meetings, Technical Visits were convened where this was possible to maximise the opportunity to learn from international experience and share ideas and experiences with a wider group of people.

The following Technical Visits were conducted during 2012 – 2015:

- Stockholm, Sweden: Meeting timed to coincide with the 12th International Heavy Vehicle Transport Technology Symposium, held in Stockholm, so members could attend.
- Chicago, United States: Visit to the Chicago Region Environmental and Transportation Efficiency Program (CREATE) Operations Centre and nearby projects.
- Montevideo, Uruguay: Visit to the Port of Montevideo and the Montevideo Airport freight facility, in conjunction with the International Seminar.
- Basel, Switzerland: Visit to the Port of Basel, an international border vehicle checking station, and motorway traffic management centre.
- Abu Dhabi, United Arab Emirates: Visit to the Khalifa Port (fully automated)
- Paris, France: Visit to the Ports of Paris, Gennevilliers

A small number of guest speakers from host countries were also invited to join the Committee at the commencement of meetings and deliver presentations on aspects of freight transport. This provided an opportunity for members to benefit from information exchange and to network with a wider group of senior officials and experts in freight transport. Where appropriate, time was also allowed in meeting agendas for members to present their own work that might be relevant to the work of the Committee or likely to be of interest to other members.

4. REPORTS

4.1. General

Technical Committee TC 2.3 was tasked to address two issues through its Terms of Reference, as specified in *Strategic Plan of the World Road Association – 2012 – 2015*.

4.2. Terms of Reference

Issue 2.3.1, Freight management.

Study the overall system of interurban / urban freight management, considering the influence of logistics strategies on: delivery models and road freight transport, dangerous goods transport, road access and guidance control, terminals and transfer stations, truck parking and security.

Investigate truck management strategies and measures to improve the economic and environmental efficiency of road freight (including noise reduction).

Report based on case studies.

Issue 2.3.2, Co-modality for freight transport

Investigate how the concept of co-modality is implemented with the objective of an optimal use of the different modes of transport for freight. Identify the initiatives, objectives, results and obstacles.

Analyse, in particular, the outcomes regarding modal shift of freight transport from roads to other modes.

Report on case studies and recommendations.

4.3. Issue 2.3.1, Freight management

Working Group 1, led by Eiichi Taniguchi, produced a report, *Framework for citywide road freight transport management*, which addressed Issue 2.3.1, Freight management.

The report, *Framework for citywide road freight transport management*, describes the research and findings about the frameworks for public sector road freight transport management (RFTM). RFTM is a key contributor to the sustainable development of urban areas, since good freight transport management supports the creation of efficient and environmentally friendly freight transport systems. The framework of RFTM is characterised by legal, institutional and strategic aspects. A unique aspect of the report is the use of case studies, based on surveys of frameworks for RFTM found in several World Road Association member countries.

The report charts the decision making frameworks that support and guide national, regional and local freight planning activities expanding on the previous work of the Committee to determine the approach and general principles that underpin a successful multi-faceted, multi-stakeholder process to achieve the goal of safe, efficient and environmentally sustainable RFTM systems.

Many of the aspects of RFTM systems are 'institutional factors', which are the domain of either the public or private sector, that in many cases require collaboration between the stakeholders to optimise RFTM outcomes. Understanding the geographical, jurisdictional and existing land use and transport planning systems that impact RFTM systems and

strategies provides valuable context when developing freight policy and managing the range of trade-offs that invariably arise.

Chapter 1 introduces RFTM, in particular explaining the need for a defined framework for RFTM systems.

Chapter 2 categorises the institutional factors to better describe the context within which the subsequent case studies operate. The following factors provide the necessary context:

- Geographic and jurisdictional arrangements
- Land use and transport planning system
- Public and private sector collaboration arrangements

It is important to identify and understand the principles that underlie a governance framework. These factors aid the decision making process in that they provide structure and guide how knowledge is harnessed to make optimal RFTM systems and strategy planning decisions.

In chapter 3 the following principles are identified as contributing to the successful development of RFTM systems and strategies:

- Guidance from multi-jurisdictional freight planning bodies
- Understanding the regional cooperative arrangements between jurisdictions
- The use of public-private partnerships
- Having a dedicated freight planning and management function
- The benefits of effective leadership
- Performance evaluation

Chapter 4 explores the lessons learned from the various case studies, categorising the cities/areas with a freight plan or those with a mechanism to regulate or control road freight flows. It identifies their distinctive characteristics and describes their individual actions.

Chapter 5 draws together conclusions from the evidence presented throughout the report, which are summarised below.

RFTM issues are complicated and challenging, balancing economic growth and environmental impacts, reducing energy consumption and improving road safety. Added complexity comes from the multiple stakeholders involved in urban freight transport, namely shippers, freight carriers, administrators, residents and others. The different aspirations of private and public entities highlight the benefits of coordination in the process of implementing policy measures. Within the public sector the collaboration among multiple local authorities in the same region, as well as those at regional, national and international level, is required.

Institutional factors for RFTM include legal issues, organisations and functionality. In various countries, organizations in charge of RFTM, based on laws or ad-hoc arrangements, are found at the city, regional, national, and international level. The common function of these organisations are recognising the importance of RFTM, sharing ideas and perspectives on RFTM for creating visions for future social and economic development of the area, finding the appropriate approaches and measures to solve related problems, implementing policy measures, and evaluating the results.

As multi-jurisdictional freight planning can provide the policy direction and context for RFTM, regional cooperative arrangements among jurisdictions are needed for the implementation of freight management activities. Public-private partnerships also play a key role in needs identification, development of solutions, and potential sharing of benefits and costs. Nevertheless a dedicated freight planning and management function is essential within city government. Among public-private partnerships of stakeholders, leadership is important to define a common vision for RFTM and promote a strategic initiative. After implementing policy measures, ongoing evaluation of RFTM performance is required, including its benefits and the evaluation of its impacts on the transportation system and its users.

There are examples of multiple local authorities within a metropolitan area developing a collaborative relationship in their freight transport management. Public-private collaborations can be a leading group playing an important role in promoting freight transport management in the city/area. There are a variety of approaches in the freight transport management for urban areas; some focus particularly on area wide logistics, while other cities implement individual issue measures in response to specific needs. Each area judges its approach on its own situation.

Many areas have designated truck routes (either regulated or preferred routing) to focus truck traffic on the most appropriate parts of the road network. Some areas specifically design road infrastructure to achieve this by providing an arterial road network, including ring and radial roads, as part of the broader plan of the surrounding metropolitan area. The development of such arterial roads often attracts logistics centres and industrial activities to adjacent areas. Where supported by land use planning, this 'new-highways-bring-industries' effect results in clusters of freight related activity along the arterial road network. Some national policies emphasises all user access to public roads whereas others adopt regulatory approaches to freight vehicle traffic specific to an area or across wider areas.

The report recommends that efficient frameworks, based upon public-private partnerships for performing RFTM initiatives, be established to tackle complicated urban freight transport problems in the pursuit of more mobile, sustainable and liveable cities. The features of a framework might be different in different countries, reflecting the economic, historical and cultural development of cities. Further research through international collaboration is needed on RFTM.

4.4. Issue 2.3.2, Co-modality for freight transport

Working Group 2, led by Rikard Engstrom, produced a report, *Moving freight transport forward – Green, Smart and Efficient*, which addresses Issue 2.3.2, Co-modality for freight transport.

This study addresses the challenges associated with freight transportation efficiency, presenting and analysing a series of good practice examples that reveal efficient freight transportation systems. It should serve as a source of inspiration for making freight transportation more efficient from the perspective of economic, environmental, and social sustainability.

The concept of co-modality is central to this report and it is defined as the use of each transportation mode in its best configuration to optimise the whole transportation chain. This study focuses on the road mode and its interfaces with the other modes. Freight

transportation produces many negative consequences, from greenhouse and pollution emissions to safety issues, and impacts on amenity. However, freight transportation as a part of the supply chain is essential for the economy and our quality of life and is expected to keep growing in the coming decades. As such, optimised transportation solutions are needed to maximize freight efficiency while minimizing negative impacts. This report suggests solutions for optimizing the efficiency of the freight transportation system.

Road transportation, alone or in combination with other modes, plays a major part in freight efficiency. Thus it must also play a key role in optimizing the efficiency of freight transportation.

The work began with a definition of what can be considered as an 'optimised' transportation solution. Optimised transportation means solutions that considerably improve on the current freight efficiency, balancing economic social and environmental impacts. An analysis of examples of good practices according to this definition helped identify the challenges regarding the pillars of sustainability, conditions of implementation, and level of transferability of each example.

The study collected relevant material for analysis through a survey borrowing from the methodology of the European Union funded research project BESFACT, which showed examples of good freight transport practice. This project guided the survey to be divided into three parts: (1) a general description of the project, (2) economy and impacts (both negative and positive) and (3) success factors, barriers, and transferability of the project.

The study collected a total of eighteen case studies, showing a wide range of possible strategies for improving freight transportation efficiency in either a single or multimodal setting. Ten cases originated from Europe, five from North America, and the rest from Asia. For the benefit of the analysis, the strategies were then classified into five types: Policy, Technology, Infrastructure, Information and Education, and Partnerships.

The analysis of these cases showed that the environmental pillar is the primary focus of most of the identified strategies. The economic pillar follows closely in terms of interest by stakeholders, but the social pillar is largely unaddressed, except where it is identified as a tertiary concern. Aside from the focus on sustainability, the main outcome of these strategies was clearly improved logistics, mainly in conjunction with a modal shift from road to another mode.

It also appears that the lack of uniformity in the level of developments of technology (vehicle/infrastructure), policy/regulations, and behaviour/logistics hinders the progression toward an optimised freight transportation system. Improved national and international dialogue and better cooperation are important areas to develop to overcome these obstacles.

Furthermore, cooperation between the stakeholders is a critical factor, necessary for achieving success in any case. Additionally, many case examples mention behavioural aspects as a key success factor. Competitiveness and being able to achieve financial benefits are, however, central for the majority of cases.

Given the relatively high cost of technology and infrastructure investment strategies, there are barriers to transferring these case studies to other places and contexts. Transferability, particularly to developing countries, is very important in order to achieve environmental sustainability, since environmental impact is a global issue. Accordingly, it appears that

policy approaches are better suited for transferability than infrastructure investment strategies. Information and education strategies are, in many cases, easier to generalize because of the low cost relative to infrastructure investment strategies.

The analysis of the case studies led the project team to make the following recommendations, addressed to various stakeholders and settings:

- Support research on improving the three pillars of sustainability (rather than on any specific mode) and strategies with a high potential for making long-distance freight transportation more sustainable and efficient.
- Adapt freight transportation policies (and regulations) to ensure that each mode alone or in combinations with other modes is used to maximize their strengths.
- Develop freight corridors with consistent design standards to facilitate interoperability and transferability to other jurisdictions.
- Provide stable and on-going funding for projects and initiatives that make freight transportation more efficient and environmentally friendly.
- Encourage the use of public-private-partnership (P3 or PPP) funding, in particular, for high-cost infrastructure investment strategies where market conditions warrant.
- Encourage cooperation among stakeholders (e.g. policy makers, operators, and shippers, and service providers) to enhance the decision making process and to ultimately achieve a more efficient freight transportation system. This could take the form of an advisory group, for instance, to improve system efficiency. This approach is used in some places in the United States and Europe.
- Given the crucial role terminal facilities play in freight transportation, particular attention should be made to their planning, design, operation, and management from a sustainability and efficiency perspective.
- Even though economic factors are very important in the decision-making process, environmental and societal considerations must also be taken into account as these two factors ultimately have economic consequences.
- Given that the transportation sector is a major contributor to greenhouse gas (GHG) emissions, minimize these emissions and energy consumption through various means including (but not limited to): international treaties, national and/or regional regulations, voluntary initiatives, and compensatory programs.
- Develop monitoring and follow-up programs to measure and evaluate the outcome of freight transportation projects and policies, especially with respect to the societal component of sustainability (since this component seems harder to identify and measure than the economic and environmental components).

5. INTERNATIONAL SEMINARS

5.1. General

Technical Committee TC 2.3 conducted two successful International Seminars during the 2012 – 2015 cycle. Seminars were held in Montevideo, Uruguay, 28 – 30 October 2013, and in Yaounde, Cameroon, 14 – 15 May 2015.

5.2. International Seminar, Montevideo, Uruguay, 28 – 30 October 2013

Held in conjunction with the 9th Uruguayan Road Congress, the Seminar was attended by 67 delegates mainly from Uruguay, along with other countries from South America; TC 2.3 members represented countries from regions around the world.

The Seminar was divided into five plenary sessions and two round table sessions. The plenary sessions included presentations from Uruguay and other countries, covering the planning, management and operation of freight transport, logistics terminals and parks, access to ports, operations at border crossings, and ITS in freight transport. The round table sessions provided a valuable opportunity for delegates to discuss issues raised in the plenary sessions in more detail.

The Uruguayan Road Association warmly welcomed delegates and interested them with remarks about the context and growth of freight transport in Montevideo and Uruguay. A briefing of the World Road Association work regarding freight transport and the current work of TC 2.3 followed.

Challenges for Uruguay include managing the growth in the freight task, in particular related to paper and grain production and the increasing proportion of the population living in Montevideo, and the imperative to increase the use of rail for the transport of freight and increase throughput from the Port of Montevideo. Opportunities exist in providing high quality and competitively priced logistics services to South America. Delegates were briefed on initiatives to improve logistics, increase velocity through the deep sea Port, implementing 'free trade zones' and intermodal facilities, and implementing ITS to improve compliance checking and logistics operations.

TC 2.3 members delivered presentations describing the findings of the urban freight management and intermodal terminal projects delivered by the World Road Association in recent years, and current work on the concept of 'co-modality', as well as other freight transport improvement projects, including BESTFACT (Europe) and the use of high productivity trucks, and provided insights into freight transport in the US and rail freight in Mexico.

On 30 October 2013, delegates participated in a very interesting technical visit, including a tour of the freight operations at Montevideo Airport, a briefing on plans for the development of the Port of Montevideo and a tour of the Port.

5.3. International Seminar, Yaounde, Cameroon, 14 – 15 May 2015

The International Seminar on the Transport of Goods by Road in Africa was convened by the Cameroon National Shippers' Council (CNSC), in partnership with Technical Committee 2.3, and under the Chairmanship of the Cameroon Minister of Public Works.

The Seminar aimed to increase the shared understanding of the economic issues in the road transport of goods in Africa, highlight the importance of road maintenance and the need to optimise the transport of goods by road, discuss the opportunity of new road infrastructure funding mechanisms, and explore the legal framework for the road transport of goods.

The Economic and Monetary Community of Central Africa (CEMAC) understands that the efficient movement of freight and improvements to road infrastructure are necessary to

support member country economies and make a meaningful contribution to the growth of coastal and landlocked countries. In Cameroon, it is estimated that approximately 60 per cent of the cost of goods is transportation, and this could be reduced to 40 per cent through improved roads.

The Seminar comprised six sessions and was attended by a number of Ministers and more than 250 delegates from around 16 countries.

In the opening ceremony, Mr Auguste Mbappe Penda, General Manager of the CNSC, welcomed delegates to the Seminar, and this was followed by an opening address from the Honourable Patrice Amba Salla, Minister for Public Works and an address from Mr Don Hogben on behalf of the World Road Association, highlighting the importance of the safe and efficient movement of goods by road. The Minister of Public Works of the Central African Republic also attended this ceremony.

During the first session, aimed at assessing the economic stakes of freight transport by road in Africa and taking stock of road transit corridors, emphasis was placed upon the share of road transport in freight transportation, overloading as a significant cause of road degradation, and on the administrative burden experienced by transporters.

To stress the importance of project planning, the second session laid special emphasis on the importance of planning in road development, on opportunities for innovative road financing, and finally on the importance of road maintenance.

The third session stressed the importance of optimisation of freight transport on corridors, based on lessons learned in Southern Africa, on themes associated with road safety, and the opportunities associated with GPS technology and on multimodal transport. This session included a presentation by Dr Rikard Engstrom on the work of Technical Committee 2.3 on co-modality.

To close the sessions, the legal framework applying to freight transport by road and international border procedures were addressed, especially with respect to Central and West Africa. The movement towards greater consistency in the legal requirements which is gradually being put in place, and its opportunities, was also discussed.

The sessions contained many good presentations and delegates were very engaged in the discussions facilitated by session moderators.

Like all countries, African countries, including Cameroon, have many challenges in the safe and efficient movement of freight. However, the substantial commitment to the Seminar and the enthusiasm of presenters, moderators and delegates to make improvements was very encouraging.

6. ROUTES / ROADS

6.1. General

Technical Committee 2.3 members contributed substantially to the 2nd Quarter 2013 edition of *Routes / Roads*. This edition focused on freight transport and authors were

coordinated by TC 2.3 and TC 2.3 members contributed six articles, including the introductory article.

The common theme for articles in the 2nd Quarter 2013 edition is the concept of sustainable freight transport. The efficient movement of freight is critical to the economies of nations and the well being of their people, but it must be managed in a way that is sustainable in terms of safety, infrastructure, the environment and liveability – especially in cities.

6.2. List of Articles Published in Routes Roads

The following articles were written by or contributed to by members of Technical Committee 2.3:

- Introductory article, Don Hogben
- Public sector governance of urban freight management, Eiichi Taniguchi
- Introducing co-modality, Rikard Engstrom
- Evolution in size and weight of commercial freight vehicles, Bernard Jacob
- Impacts from truck traffic on road infrastructure, Bernard Jacob et al
- Greenhouse gas abatement potential in the Australian transport sector, Adam Ritzinger et al

7. BIBLIOGRAPHICAL REFERENCES

Extensive bibliographical reference lists are included as part of the two Working Group reports:

- *Framework for citywide road freight transport management*
- *Moving freight transport forward – Green, Smart and Efficient*

**TECHNICAL COMMITTEE 2.4
WINTER SERVICE**

2012-2015 ACTIVITY REPORT

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And the whole of the members of committee 2.4.for their active participation

1. Introduction and characteristics of TC2.4

Initially the only mission of this committee was to organize the International Winter Road Congress, but over time it came to include the creation and the dissemination of information through various productions and working groups while preserving the International Winter Road Congress. Technical reports have been produced since 2002 (Sapporo congress) at the time of each cycle. One of the reports is emblematic of the true nature of the committee is the Snow and Ice Data Book which is now in the fourth edition. In conjunction with the organization of the Winter Road Congress every four years an international snowplow championship is organized to demonstrate the skill of operators from many countries.

Currently TC2.4 consists of 61 members from 31 countries. Typically meetings of the Technical Committee see approximately 20-30 participants, who represent the core of the active participants.

2. Working program and organization

2.1 Terms of reference

Issue 2.4.1 Crisis management of unusually severe and/or sustained snow events	
<i>Strategies</i>	<i>Outputs</i>
From actual case studies of unusually severe and/or sustained snow events which have produced large disturbances to the transport system, investigate how the institutional arrangements, operations measures (including supply and distribution of de-icing agents), coordination between transport modes and the provision of information to users can most effectively contribute to minimize disturbances and lead to a rapid return to 'normal' conditions	Case studies report and recommendations
Issue 2.4.2 Sustainability and climate change considerations in winter operation	
<i>Strategies</i>	<i>Outputs</i>

Study the environmental impacts of winter maintenance taking into consideration increased variability in weather conditions including uncertainty regarding the occurrence and magnitude of harsh winter conditions	Guidance report.
Issue 2.4.3 Advanced technology for data collection and information to users and operators	
Strategies	Outputs
Investigate innovative approaches for data collection and information to users and operators for the purpose of safer winter operation, with particular focus on vehicle - based technology.	Case study.
Issue 2.4.4 Preparation of the 2014 Winter Road Congress in Andorra	
Strategies	Outputs
Identify the priority themes for the congress while taking into consideration the concerns and possible contributions from other Technical Committees (e.g. bridges, pavements, etc.) and prepare the scientific program. Up-date the Snow and Ice Data book	Definition of the technical program incorporating session(s) on the various criteria of winter operation for decision makers and acceptable levels of service. Production of the proceedings. Up-dated electronic version of the Snow and Ice Data Book

2.2 Organization of the committee

To address the terms of strategic plan, TC2.4 organized itself into various working groups, three corresponding to Issue 1 to 3 with the mission of producing reports. For Issue 4, International Winter Road Congress, six (6) reviewing groups were organized to correspond to the topics of the Congress in order to validate the proposals of communication.

The participants of these review groups were also responsible to chair or co-chair the sessions at the time of the congress.

A representative of TC2.4 participated in the Committee, establishing a link between that Committee and TC2.4.

The update of the Snow and Ice Data Book is a collective work whose production was ensured by a representative of the country organizing the congress.

The secretaries and chairman ensure the link with the general secretariat and put in motion the various activities required.

Committee meetings provided opportunities for technical presentations proposed by TC members and technical visits organized by the host country. All members of the committee actively take part in the meetings, discussions, and the decisions.

3. International Winter Road Congress

To organize the International Winter Road Congress, it is a journey of more than four years, during which it is necessary to ensure a multitude of things. First of all is the technical part of the congress in which it is necessary to decide on the session themes. A total of eight session chairs were identified for the congress of Andorra among others, in addition to the session on structures, tunnels and bridges. Once this has been determined a call for papers is issued, abstracts selected and communication with the authors to determine the production of the final papers, and to make the final selection of those papers to be presented. The Congress is composed of presentations by authors; demonstrations of materials and equipment, technical visits, snow plow championship, conversations with the vendors, and cultural activities for the companions of the congress delegates.

3.1 Scientific program of the congress

To address Issue 2.4.4, TC2.4 participated in the development of the scientific program of the congress and strived to define a program focusing on the general Topic of the Congress: "**To reconcile road safety and durable development with climatic changes and economic crisis** "

The tunnel committee and the bridge committee were involved in the definition of the program since a specific theme of tunnels and road bridges was proposed to the authors making it possible to widen the panel of the sessions and the participants.

Eight main topics were identified and proposed in the following way:

- Winter viability and climatic change
- Winter viability in a context of constrained budget
- Extreme events
- Management of winter viability
- Operational approaches, equipment and materials,
- The user in winter conditions
- Tunnels in winter conditions
- Road bridges in winter conditions

3.2 Course of the congress

There were approximately 950 participants for the conferences, 3000 visitors, 600 witnesses for the snowplow championship, 150 papers divided into 38 sessions and 180 poster presentations, this first quantitative look gives the dimension of the event, a first for the principality of Andorra and a true success.

3.3 Opening of the congress

Three major events represent the opening of the congress:

- The opening session during which official representatives of Andorra and PIARC made a warm welcoming speech and formulated all the wishes of success for the congress. During this session a particularly appreciated presentation on climate warming was made.
- A plenary session made it possible to enter directly the heart of the subject, as representatives from ministries of various countries answered a variety of questions such as the consequences of the climate warming on the organization the winter service and the problems of avalanches for the access in Andorra.
- The inauguration of the vendor exposition.

3.4 Technical sessions

The technical sessions were chaired and co-chaired by invited persons and TC members. Some 150 communications were divided into 38 sessions with discussion after the presentations adding interesting elements to the presentation. All the papers have been published on a CD Rom for the congress.

3.5 Poster session

Each speaker selected to make a presentation was invited to make a poster presentation. These poster sessions were ideally located in the exhibition area. This opportunity to discuss papers on a personal level with the authors was a great success.



The poster session met large a success.

3.6 Exhibition

The exhibition area of 4,500 square meters was especially conceived for the occasion of the XIV Winter Road Congress. It was divided into three parts devoted to the institutional stands, technical material, and the presentation of machinery. It should be noted that the exhibition was open certain days to the public, which made it possible the citizens of Andorra to take part in this demonstration.

3.7 Machinery demonstration



The equipment demonstrations were held at the Envalira Pass and made it possible to see the latest innovations, blades, spreaders and other winter maintenance machines.

3.8 Snowplow Championship

The 2nd International Snow Plow Championship took place during the International Winter Road Congress in Andorra.

This event was organized by the Department of the Conservation and the Exploitation of Roads (COEX) depends on the Ministry for the saving and the Territory in Andorra.

The tests proceeded February 4-5, 2014 on the course of Grandvalira at an altitude of 2,200 M. located at Envalira Pass, approximately 28 kilometers of the general road 2 (CG2). This friendly competition between snow plow drivers coming from around the world made it possible to evaluate their abilities on a course designed to test their skill and knowledge on safety and mechanics. Twenty-five participants competed with the winner being a representative of Andorra.

3.9 Technical Visits

Many technical visits were conducted. The National Traffic Center has a very significant component associated with the monitoring of the tunnels. The Tunnel of Envalira whose installations are at an elevation of 2,050 m is among the highest in Europe. The Funicamp with a gondola of 6 km, longest of Europe, makes it possible to connect the town of Encamp and the ski resort located at an altitude of 2,052 m.

3.10 Closing session

Andorra's Minister for the Economy, the President of PIARC, and the chairmen of the Technical Committees for Winter Service, Tunnel, and Bridge provided the technical closing of Congress. It provided the opportunity to recap the technical sessions and to emphasize the facts and innovations presented during the technical program.

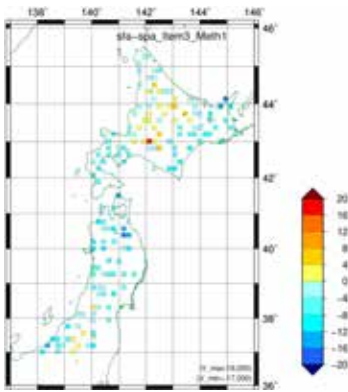
The main topic of the congress: "To reconcile road safety and durable development with climatic changes and economic crisis" represents the need we face today to address the dynamic nature of winter service which includes the safety and mobility demands of the users and concerns regarding sustainable approach to achieving these goals.

The technical thématiques are the subject of a rapid syntyhèse below.

Topic 1: Winter service and climate change

Winter service related activities are directly affected by climate change. Some areas will exhibit overall warming which is noticeable even at the scale of a snowplow operator. In contrast, others areas have been experiencing weather anomalies, as reflected by intense storms, atypically mild or harsh winters, and on the whole, events deviating from the norm. Service organizations must be capable of responding to such changes.

In other places there have been sudden changes resulting in storms that are abnormally easy or very hard where overall the events are moving away from normality.



Variation concerning the maximum intensities of falls of snow of 24 H in Japan, Comparison between the periods (1979-2003) and (2075-2099)

This is particularly evident as the number of presentations in this topic was very high and often mentioned in the presentations of other topics as well.

Topic 2: Cost and benefit of winter viability in a context of constrained budget

Quantifying benefit/cost of winter viability is an important consideration and generated many papers. As the economic crisis touches many countries, adapting winter viability to constrained budgets sometimes results in significant reductions. Strong economic justification is needed for making winter service decisions and for analyzing the direct and indirect benefit.

The question of the return on investment was discussed in terms of optimization of treatments and materials and the impacts on safety. There are also considerations associated with the infrastructure as well, such as the choice of surfacing materials and composites where deicing chemicals are included within the pavement structure.

Topic 3: Extreme events in winter

Extreme events seem to be an increasing occurrence. During these events the organization of the usual response is not sufficient to generate an effective response. The concept of an extreme event deserves some discussion. Is an extreme event one that is hard, severe, rare, etc.? One presentation gave a progress report on these concepts.



Closing of E136 in Norway

Many countries were confronted over the past few years with significant snow falls that resulted in defining new guidelines regarding, in particular, the inventory control of salt, communication with the users, and the management of mountain passes. The winter is also a source of increased congestion for roadways where several ways to approach the analysis were proposed. Other natural events can complicate the response as in the example of the volcanic eruption and difficulties of winter viability experienced in Argentina, which was presented.

Topic 4: Management of winter viability

The climatology and the definition of winter indices remain important topic of discussion. Societal aspects are becoming increasingly important as the notion of the user/citizen being an integral part of the culture of the winter response.

The communicating of the winter response in real-time was the subject of presentations along with requirements of the vehicle and in particular winter tires and other equipment to improve traction. Pedestrians and cyclists are becoming important concerns of the managers and many efforts were made in this direction.

More or less complex models are being created that integrate many data: history of interventions, traffic, weather data, and the state of the roadway are used to make forecasts of treatments and surface condition, making it possible to develop specific strategies of treatment.

Performance measurement is necessary to validate the various elements and response to the winter events.

Topic 5: Operational approaches, equipment and products for the winter conditions

Product certification remains a current topic and studies set out to determine product performance and safety relative to the environment. Spreading material on a pavement needs to be even and in the range of at most tens of grams of product per square meter, deployed from a vehicle moving faster than 50 km/h. This is a very delicate operation.

This justifies many research projects and development. But it is also involves the operator who can control the equipment to produce this result.



Control transverse dispersion (Cerema/Semr France)

Other alternative methods for dealing with snow are also considered. The Japanese utilization of geothermal energy in snow melting systems and direct heating of the roadways are good examples of these alternatives. Data acquisition is of significant importance to facilitate decision making in real time or to characterize routes or situations, as is the case with thermal mapping.

Topic 6: The road user in winter conditions

Information on the condition of the network is essential for the user to make travel decisions during winter. Various dedicated support systems have been developed including Web sites, guides, and various means to communicate with users.

Heavy commercial vehicles combined with steep grades and snow generally lead to difficulties, particularly if they are not equipped for winter travel. However, objective elements were presented and it is now possible to associate various types of configurations with their capability of crossing.

The legal aspects were included in the discussion as well.



To allow the circulation of the bicycles Quebec

Topic 7 and 8: Road Tunnel and Bridges under winter conditions

This topic included various subjects:

- Maintenance under severe winter conditions;
- Measurements to improve safety and reduce the risks due to the winter conditions;
- Drainage and formation of stalactites;
- Implications on the behavior of the users.
- Management of snow clearance on the bridges;
- Alternative methods of deicing on the bridges;
- Impact of ice and snow on the bridges according to building material;
- Means of protection of the surface of the concrete exposed to snow and ice;
- Estimate and the measurement of the load of snow.

3.11 Social activities

Various social activities were proposed including, drive on an ice track, skiing, visits (Barcelona, Carcassone), and the closing dinner was particularly appreciated.

3.12 Results of the congress and conclusions

The Andorra congress was a true success due to the quality of the organization and presentations and participation. Some points are to be improved, particularly regarding the publication of the minutes and of the Snow and Ice Data Book, which were relatively late. These points have been discussed within the committee.

4. PIARC World Road Congress: Korea

The International Winter Road Congress and the World Road Congress take place alternatively every two years, which offers the opportunity for TC 2.4 Winter Service to organize a session at the time of the congress of Seoul.

The committee is in charge of a half-day session during which the following will be presented:

- Activities of the cycle in progress through this report,
- Reports of the various working groups,
- The introductory report whose objective is to highlight the interest of the session,
- Presentation of the snow and ice data book,
- Presentation of the oral communications selected,
- A round table joining together of the specialists in winter service,
- A poster session where all the presentations selected is presented.

The three topics were specified in the call for papers:

- Strategies of winter viability and climatic change
- Multimodality and climatic adversity in winter
- Advanced technologies and management of winter crisis.

The organization of the round table and the finalization of the introductory report are still in progress at the time of the drafting of this activity report.

5. International seminars of winter maintenance

Seminar Santiago, CHILE



A very congested roadway in Santiago

The seminars of TC2.4 Winter Service are always moments of privileged exchange. During the current cycle, a seminar was organized for the first time in South America, in Chile, under the auspices of the Chilean Road Administration of the Public Ministry of Labor, of the Chilean Association of Roads, the college of engineers of Chile and of course PIARC Technical Committee 2.4 Winter Service. This seminar entitled "Winter Maintenance Operations in High Mountain and Extreme Zones" took place in June 2013.



The road 60, which connects Chile and Argentina.

Presentations were made regarding the latest research, field practices, organizations, products, and equipment by attendees from Asia, North America, South America, and Europe in addition to the experts from PIARC TC2.4 Winter Service. To reinforce the other presentations, the experts of South America presented the approaches developed to face the particular problems associated with the zones of high mountains, in a context of relatively high economic growth and creation of new infrastructure.

To manage the formation of snow-drifts, active avalanche control measures, to allow the accesses to the ski resorts by ensuring the safety of the users, to maintain the flow of heavy commercial trucks in spite of the climatic adversities represent the many challenges the owners of the networks in high altitude zones with harsh climates have to deal with.



Member of committee 2.4, specialist in the mitigation of drifting snow.

More than two hundred and fifty (250) participants attended the conference, with forty (40) speakers of very diverse backgrounds including leaders from the Chilean Road Administration, mining owners, a doctor, soldiers, road owners, suppliers of materials, specialists in the management of the avalanches, a manager of hotel, persons in charge for the direction of the borders, academics, PIARC TC 2.4 Committee, and a whole panel whose uniqueness made it possible to better include/understand the complexity of the approaches and the necessary cooperation between all the parties present.

One will quote the example of the avalanches that illustrate this matter well. It is first of all a question of identifying the places and the frequency of the phenomena, by giving a history, starting from files, near the populations and of the owners. One seeks starting from the ground up to model, using topology, the mechanical behavior of snow, and to establish a concept of risk, this information are then charted. It is then a question of seeking preventive approaches that result in reducing the impact (avoids avalanches) or protecting the road (gallery). Solutions do exist: it is a question of starting the avalanches before they release naturally (Gazex, Gatex, deposit explosives).

Information, the management of the traffic, utilizing convoys form part of actions taken, however in certain cases, rescue squads must intervene to provide assistance to the victims caught in releases.



Gazex a system for active avalanche control used everywhere in the world

The other subjects that were discussed included technical topics relating to snow clearance and salting and approaches more political in nature like the management of the international routes.



The seminar also provided the opportunity to honor a worker of the host country. Road cleaning, is more than a job, here Mario Ortega receives the honors and a small gift from PIARC for more than forty years of service of the road users.

The army took an active part in the seminar and made several presentations including a particularly impressive one regarding the ascent of Everest by a Chilean team! The exercise is interesting, but also dimensioned practical techniques typically utilized in Chile as the border with Argentina in the Andes is at very high altitude.

A technical visit was made to Portillo (approximately 3,000 m altitude), a well-known ski resort near the border on Chile and Argentina. By taking road 60 to this site allowed the participants of the seminar to visualize on the ground the true operational difficulties of the routes in the mountains.



Equipment exhibition at Portillo, which is dominated by 5000 m. mountains.

During these three days exhibitions of equipment were held on the two sites, Portillo and Santiago. The excellent organization must be greeted as well as the quality of the presentations. This seminar cemented the connections with PIARC with the hopes of continual cooperation.

This seminar was a very good introduction for the International Winter Road Congress in Andorra in February 2014.

Workshop Helsinki, FINLAND

The seventh meeting of TC2.4 was held in Helsinki, Finland in conjunction with a workshop focused on “Mobile road surface condition measurements in winter” in March 2015. Approximately sixty (60) participants from many countries were present at this workshop.



Presentation summarizing the workshop

Equipment suppliers and users made very interesting and informative presentations. Many questions were formulated and the discussions were very rich. Technical visits were organized for the members of the committee, which made it possible to see a road operations center, a winter service provider's maintenance facility, and a manufacture of RWIS equipment and sensors.



Visit to the depot of a providing company

The Finnish transport agency was strongly involved in the organization of the meeting and the workshop, which was very interesting and well done.

6. TC Working groups

Issue 2.4.1 "Crisis management of unusually severe and sustained snow events"

Based on case studies of exceptionally heavy and long duration winter weather events creating significant disruption to highway networks, this report shows how institutional arrangements, operating measures (including supply chain and distribution of salt), coordination between the modes of transport and the dissemination of information to the users can contribute in the most effective ways possible to minimize the disruption of travel with the quick return to the normal conditions.

Issue 2.4.2 "Sustainability and Climate Change Considerations in Winter Maintenance"

This report describes climate change considerations within the framework of winter service. The first step during the launch of this project was to conduct a literature search relating to climatic change with respect to winter service, to describe the content by identifying six categories; level of the service, maintenance of the roads, forecast model information with respect to the snow plow driver, indicators to characterize the variation of climate and winter maintenance operations, different methods, infrastructures.

In the typical the "best practices" are the methods that are most durable and those most used today, were analyzed. This reduces to the question of what to take into account regarding climatic change for each of the three activities, restore or maintain the condition of the pavement, to inform the users and to implement measures for the management traffic. Regarding the maintenance or restoration of service, it reminds me of a number of fundamental steps to make preventative treatment, techniques to control the materials, the absolute need for mechanical snow plowing rather than using chemicals to melt the snow and ice, the use of appropriate chemicals, and so on.

To answer the question of information to the users and the implementation of measures for the management of the traffic, the various manners are described regarding communicating and informing the road users, the policies of maintenance, road information such as congestion and delays, and the measures underway to clear crashes

when they happen. This report also presents new equipment or technologies to facilitate the planning the daily work of winter maintenance.

Issue 2.4.3 " Advanced technology for data collection and information to users and operators "

This report gives a description of new information technologies usable to improve winter service.

Advanced technologies are developed and deployed on mobile platforms to collect data concerning pavement condition and are transmitted to operations centers to help make tactical decisions during winter events. These data are also available to support advanced information systems available to road users during the winter storms. Case studies developed in this report make it possible to study the applications and the deployments of these advanced technologies to show the feasibility and the utility of these systems.

Issue 2.4.4 see chap 3 and chap 9

7. Snow and Ice Data Book

The "Snow and Ice Data Book" (issue 2.4.4) is a synthesis of winter maintenance practices of the various member states of the committee. This synthesis was first compiled and published as part of the PIARC Winter Road Congress in Sapporo in 2002. Since then since then it has become a tradition and each new Winter Road Congress sees the publication of a new version of this invaluable document. Currently 27 national reports are produced in three languages: French, English, and Spanish.

There is a common framework for the information provided by all the countries. This common outline of climate and operational realities makes it easy to make comparisons. There are four principal topics described for each country; a discussion of its geography, demographics, and road network, a description of the climate and weather phenomena likely to appear, a description of the methods of management of the roads and the developments and research in progress that will mold its winter maintenance of tomorrow.

The International Winter Road Congress of Andorra in 2014 saw the publishing of the fourth edition. This edition saw a update by many countries and grew by the addition of entries by from South Korea and New Zealand.

Winter service is fundamental for many countries, it contributes to the safety of the user as they use various modes of transportation such as vehicles, walking, cycling or public transport, with respect to the economic activity because of many sectors use the methods dependent on the road network. It is also a question of dealing with the environment and more broadly, to implement sustainable approaches.

The publication of this document took place thanks to the effort of all the members of the Technical Committee 2.4 and of our colleagues from Andorra.

This document is free of charge in English, French or Spanish on the PIARC web site (if an account is created)

Beyond gaining knowledge and information the goal of this publication is to offer a moment of pleasant reading punctuated with illustrations and photographs, allowing you to see what is truly winter on the road and how it should and can be dealt with.

It's possible to download the « Snow and ice data book » on the PIARC web site.

8. Terminology

The terminology of the field of winter service is particularly rich and important, the Inuit population (cultural group inhabiting the Arctic regions) use more than 50 words to qualify snow. The TC2.4 has a member who liaises with the PIARC Committee on Terminology (CTERM) on a regular basis, and provides updates of the various products provided by CTERM. The TC2.4 committee contributes actively to the PIARC terminology database by including glossaries in all technical reports to be submitted by the committee's work groups.

9. Production of articles

The TC2.4 produced the following articles :

To cross the Pyrenees thanks to winter viability Andorra-France as from the years 1930
Jordi Garcia Llevet N 358

Congress of Andorra: a first outline of the technical program - Didier Giloppé N 361

Andorra 2014: a success for the country and the area of the Pyrenees - David Palmitjavila
N 362

General Report/ratio of XIV international Congress of winter Viability in Andorra - Didier
Giloppé (CT 2.4), Ignacio del Rey (CT 3.3), Satoshi Kashima and Pierre Gilles (CT 4.3)
n362

10. Partnerships and links with other organizations

Many partnerships exist with various organizations and international associations either through official exchanges or via the participants in the committee members of these entities.

CEDR (Congress of European Directors of Roads)

A representative of the CEDR, Bine Pengal, was invited to take part in the meeting of TC2.4 that took place in conjunction with the Winter Road Congress of Andorra. He provided a briefing of the activities of Project N3, Standardization of Winter Maintenance. A questionnaire was sent to the Member States in order to collect information to establish the requirements of the project.

BRA (Baltic Road Association) Association of the Baltic Roads

The association of the Baltic Roads offered to TC2.4 the opportunity to make a presentation of the program of the congress of Andorra at the time of the XXVIII International Conference of the Baltic Roads with Vilnius, Lithuania of August 26-28, 2013

SIRWEC (Standing International Road Weather Commission)

The SIRWEC congress is held every two years with every other congress held in conjunction with the PIARC International Winter Road Congress. There are strong connections between the two organizations.

AASHTO (American Association of State Highway and Transportation Officials), and TRB (Transportation Research Board)

Two representatives of the TRB took part in the TC2.4 that took place in conjunction with the Winter Road Congress of Andorra. A member of the American Association of State Highway Transportation Officials (AASHTO) Snow and Ice Cooperative Program (SICOP) provided a briefing of the activities of North-American American Public Works Association (APWA) conference on snow, and of the connections with AURORA. The exchange of information from within the framework of the PEER Exchange held in Vancouver,

Washington (USA) that lead to the creation of the “top-10 activities of a world-class winter maintenance program”, which the TC2.4 members took part in.

The Chairperson of the TRB Committee on Winter Maintenance and member of AASHTO-SICOP presented the activities of TRB Committee on Winter Maintenance research undertaken with AURORA.

Cen TC 337 European Committee of Standardization.

Several members of committee 2.4 take part in European work of standardization, which meets regularly.

11. Reflections

To fulfill the mission of PIARC certain points must be improved, particularly on expanding interaction with other countries and on the organization of the seminars.

The Snow and Ice Data Book will be the subject of some improvements and will be published at the time of the Winter Road Congress of Gdansk. This will become one of the major objectives of TC2.4. Considerable attention will be paid to the quality of the contributions and in particular to the quality of the translations.

An orientation towards the problems of winter viability in urban environment seems necessary just as approaches concerning multimodality.

12. Conclusions

TC2.4 is an active committee, which has the responsibility to take part in the organization of a specific congress for winter service. The outputs from the committee are thorough reports, Snow and Ice Data Book, and the successful Winter Road Congress of Andorra.

The committee members are particularly active and many participate in other international groups. There are many other countries subjected to problems of winter viability (Russia, China, countries of South America, etc.) that do not regularly take part in the committee if at all. Some evaluation into ways to encourage their participation in country should be considered.

13. Bibliographic references

Acts of the congress of Andorra

Minutes of the various meetings of TC2.4

Program seminar "Operations of winter viability in High Mountain and extreme zones" Chile in June 2013

Program workshop "Mobile road surface condition measurements in winter" in March 2015, Helsinki, Finland

Snow and Ice Data Book - SIDB 2014FR

**TECHNICAL COMMITTEE 2.5
RURAL ROAD SYSTEMS AND
ACCESSIBILITY TO RURAL AREAS**

2012-2015 ACTIVITY REPORT

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Members of the Committee who contributed to the activities

Argentina	Nicolas	BERRETA
Argentina	Nestor	FITTIPALDI
Benin	Issere Joseph	DOSSOU
Benin	G. Boniface	OGOUMA
Bolivia	Vladimir Omar	CALDERON YAKSIC
Bolivia	Roberto	SANDOVAL
Burkina Faso	Tchona	IDOSSOU
Burkina Faso	Adama	SORGHO
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Chile	Mario	ANGUITA MEDEL
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Congo-Brazzaville	Pierre	MISSENGUE
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El Salvador	Miriam	LOPEZ
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Japan	Hirofumi	OHNISHI
Mali	Dramane	DIALLO
Morocco	Mohamed	BEJRHIT
Morocco	Abdelouahed	BOUDLAL
Mexico	Aaron Angel	ABURTO AGUILAR
Mexico	Jose Alfonso	BALBUENA CROSS

Mexico	Abraham Eduardo	CHAIN SANCHEZ
Nicaragua	Karen Deyanira	MOLINA VALLEY
Nicaragua	Amadeo	SANTANA RODRIGUEZ
Nicaragua	Khristen	
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Central African Republic	Benoit	NGANAFEI
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Central African Republic	Mathias	HAND
Central African Republic	Augustin	PHONZE
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AIPCR-PIARC	Case Florez	MIGUEL

AGEPAR
TECHNICAL GROUP IBEROAMERICANO (GTI)

Themes and programs of work

2.5 Technical Committee, **systems OF RURAL ROADS AND ACCESSIBILITY TO RURAL**, part of the strategic theme 2, "Access and mobility". The aim of this strategic issue and the Committee promoting the improvement of access and mobility to the rural community and the industry to improve the operation of the road network and integration with other modes of transport, on the other hand the strategic theme 2 recognizes that highways authorities providing a service to the rural communities and the industry Recognizing in this way to such groups as clients. At the heart of this problem is the need to provide services in a predictable manner and ensure that the capacity of the network is at an appropriate level.

The accessibility of the road infrastructure for rural communities remains an important issue for combating poverty, giving access to social, educational and employment opportunities. The Technical Committee 2.5 will focus on the effect of national policies in that provision, new strategies for sustainable management and the maintenance of rural roads.

The Technical Committee 2.5 "Systems of rural roads and accessibility to rural areas" which is under Strategic Theme 2 "Access and Mobility" for 2012-2015 cycle includes the following sub-themes:

TC 2.5 - Rural areas roads and accessibility systems

Question 2.5.1

Sub-theme 2.5.1

National policies for rural roads sustainable systems

Strategies

Analyze national policies in different developing countries and conservation of rural roads systems considering institutional aspects, issues of administrative decentralization and funding mechanisms.

Results

A report that presents a comparison of national policies from different countries, their achievements and challenges.

Sub-theme 2.5.2

Management of conservation and improvement of rural roads

Strategies

During the last decade a series of initiatives has been launched to promote the development of micro-enterprises and promotion of involvement of local communities in the maintenance and improvement of rural roads. A number of case studies from several countries were reviewed. From these case studies the lessons were learned, critical success factors were identified in relation to the different geographical and socio-economic contexts.

Results

Report on the best practices identified from these case studies, the applicable techniques are highly dependent of geographical and socio-economic contexts.

Item 2.5.3

Promote sustainable systems of rural road maintenance

Strategies

This strategic sub-theme made reference to the different case studies reviewed and highlights the secondary problems that are associated with inadequate maintenance of rural roads, the impact of these challenges are terms of financial and socio-economic within rural communities.

Results

Brief report to the attention of policy and decision makers.

Organization

1.1 Organization of Technical Committee

The TC 2.5 structure comprises 57 members, 20 members, correspondents and 15 member associations (including four young professionals).

The CT was organized as follows:

President	Roberto Sandoval, Plurinational State of Bolivia
English-speaking Secretary	Dumisani NKABINDE (South Africa)
French-speaking Secretary	Paola VILLANI (Italy)
Spanish-speaking Secretary	Alfonso BALBUENA (Mexico)
Web administrator	François Chaignon, France
Personal assistant to the President	Vladimir Calderón, Plurinational State of Bolivia
The working group 1 leader	Paola Villani, Italy
The working group 2 leader	Isséré Dossou, Republic of Benin
The working group 3 leader	Abraham Eduardo, Mexico
Ibero-American regional group leader AGEPAR	Eliud Ayala, El Salvador
Contact the terminology Committee	Paola Villani, Italy Mohamed Himmi, Morocco Alan Taggart, United Kingdom Oscar Gutierrez Bolivar, Spain OHNISHI, Hirofumi (2 STC) TANINI, Tomonobu (PIARC-GS) Junichi MIYAZAKI (PIARC-GS)
PIARC Technical Advisor	

Technical Committee 2.5 for the period 2012-2015 goals are achieved through the activities undertaken by four working groups and a regional group:

1.2 Working groups

To fulfil the mandate prescribed by PIARC (on PIARC blue book cycle 2012-2015) as well as to promote continuity of the TC 2.5 members involvement, the TC members met every six months. Within the bi-yearly TC meetings, the regional groups (AG also organised meetings which were influential to the TC's functioning. The TC members developed a questionnaire during TC meetings. The questionnaire was modified a number of times in order to be relevant to all diverse countries' Roads Authority that it was to be issued to. With much effort that was dedicated to this questionnaire, it is recommended that this questionnaire should be adjusted according to the next cycle's Strategic Plan.

Technical Committee 2.5 for the period 2012-2015 goals are achieved through the activities undertaken by three working groups which are aligned to the strategic sub-themes as follows:

- Working Group 1
National policies in the field of sustainable accessibility for rural areas (item 2.5.1)
- Working group 2
Problems management of planning of rural roads, improvement and maintenance (item 2.5.2)
- Working group 3
Promotion of sustainable systems of rural roads maintenance (Agenda item 2.5.3)

1.2.1 Working Group 1

National policies in the field of sustainable accessibility for rural areas

The main objective was to analyze national policies in different countries for the development and maintenance of systems of rural roads that focus on the institutional aspects, questions of decentralization to local and regional authorities and funding mechanisms.

The technical report presents references of national policies, the achievements, comparisons, problems and conclusions.

1.2.2 Working Group 2

Planning rural roads, improvement and maintenance management problems

During the last decade a number of initiatives have been launched to promote the development of microenterprises and involving local communities in the maintenance and improvement of rural roads. The traditional approach in road maintenance and improvements is hindered by poor support by the local communities it supports. The communities feels that they are less responsible if they were not involved during the planning, construction and ultimately maintenance of the roads servicing them. The approach of getting their involvement from planning stage and getting their opinion makes them creates a sense of ownership of the roads, that helps in getting their positive involvement in making sure the road is well maintained. Their involvement during maintenance stage offers them employment opportunities which was not the case in the traditional approach.

The emergent of the technology has assisted the greatly in planning, programming, record keeping and financial budgeting for the development and maintenance of road networks. These software's makes it easy for the decision makers to priorities budgets and to assess the road network conditions using the road deterioration models in-built into these softwares.

A number of case studies from several countries were reviewed. From these case studies the lessons were learned, critical success factors were identified in relation to the different geographical and socio-economic contexts.

The technical report references national policies and achievements (successes) based on case studies with the respective conclusions.

1.2.3 Working Group 3

Promotion of sustainable systems of rural roads maintenance

The case studies highlights the impact of lack of maintenance of rural roads and accessibility to rural areas on socio-economic and financial implications on the rural communities.

1.3 Outputs from the working groups

1.3.1 Working Group 1

The output from the Working Group1 is analysed according to the defined points below. As can be noted on the points below the results are in some instance promotes a need to invest more resource (possibly on the next cycle) on the issues identified.

1. Countries must have very well defined policies about the maintenance of rural roads. Each country's policy should clearly make reference to the following critical issues:
 - Management
 - Prioritization
 - Decentralization
 - Financial, technical and social sustainability

According to the analysis and discussions throughout the various meetings and seminars carried out, definitely the subject of State policy for the sustainable maintenance of rural roads and access to rural areas is an issue administratively handled differently in each country. However, it was identified that it is almost common to all countries, especially developing countries, that participated in the study that the State policy is governed politically.

The difference in political leadership and atmosphere from country to country makes it impossible for one solution to be adopted by all the countries. It was concluded that regardless of the country in question, the policy should be clear that the adopted administrative process should ensure the is a special mentioning or provision for rural roads and its sustainability. In other countries such as Chile and other Central American States, the administration and implementation of projects in rural roads is done so by the locally based roads authorities and mostly successful.

2. There must be a specific fund for the maintenance of rural roads.

A theme that was very much commented on and discussed by the Committee, referred to a specific fund for rural road maintenance and the question always was the source of funds. According to the information provided by several Member States and in accordance with the previous point of management and prioritization, the following types of sources of funding that are used for the maintenance purpose were identified:

- Tax
- Percentage of fuel (fuel levy/tax)
- Weights and measures
- Private contributions
- Public Private Partnership (PPP)
- Contributions
- Concurrent funds (Central Government, local governments and municipalities)

3. Community participation in the planning and implementation of maintenance

During the present and previous cycles, it has been generally observed that a greater community participation in planning as well as in implementation of sustainable road maintenance of the rural roads. This situation has contributed positively in making communities to take ownership of the maintenance of the roads. It has also helped the decision makers in motivating for the funds (economic resources) especially for the maintenance.

4. Be considered on a priority basis, care of the environment in road conservation tasks.

The care for the environment has been a debated topic. Policies have been developed in other countries that is used during planning, construction and maintenance of roads to make sure that the environment is not affected negatively by the construction or maintenance activities. Common to all countries is the approach of motivating to use locally available material instead of bringing suitable material from other areas. In this approach care is taken that the locally available material meets the minimum technical requirements for the maintenance of the roads.

5. Implement new technologies for soil stabilization.

In this cycle, this topic has been widespread and very much commented on by the Committee in the sense that through technological solutions and use of locally available materials road construction is possible. The use of soil stabiliser transforms the material that was not suitable for construction into a well suited material that meets all the minimum technical requirements. With just a fraction of additional cost, the locally available soils are stabilised resulting into roads that performs better for a long time which minimises the frequency for periodic maintenance. These roads there for needs very little economic resources for routine maintenance.

It should be noted that this application of soil stabilisers also links to the previous point of promoting environmental sustainability. The lesser the frequency to do a periodic maintenance means that there is a lesser material required that could have been extracted from the ground thereby reducing ground scour.

1.3.2 Working Group 2

The output of this working group as already stated that it involves the planning, improvement and maintenance management of rural roads. During the working of the the group many important aspects to enhance planning, improvements and maintenance of rural roads were debated. There working group introduced a very important aspect in roads maintenance which is the technological application into road management. The various points are highlighted on the points below.

1. Implement the use of asset management systems and/or the rural road network management system.

Using the cases studies from different countries, the need to create a system that can be easily used by the decision makers in planning, managing and prioritisation of projects within the rural road network was identified. The following points needs to be investigated:

- Emphasize the importance of asset management by modern systems (softwares) of management of the sustainable maintenance of rural roads.
- Importance of maintenance to ensure food security and access to health and education.
- Environmental impacts(positive or negative) due to construction or maintenance specific projects.
- Effects of the changing environment (new methods, more traffic, increased the groups of interest, etc. requirements) which have executed works.
- for achieving sustainable maintenance, a matrix of different indicators can be used. This matrix will create a score that can be used to rate projects or programme during the budgeting of process. In this case for forward planning can be achieved for the sustainable maintenance of the network of rural roads. That will be a of the main methodological elements of evaluation of projects and programmes.

2. Define a methodology for prioritizing the attention of rural highways.

This is a challenging task for all roads authorities. If a methodology is developed and implemented successfully for prioritisation of road maintenance, it can be easily adopted as a permanent policy for the rural roads. There are countries that have already used this method as part of their policy.

3. Promote the creation of local microenterprises, for routine maintenance for undertaking those activities that do not require skilled labour or construction machinery.

This initiative has already been implemented practically in all continents and can therefore be considered the very successful, regardless of the form of how it is carried out. Seen in Latin America, Africa, Asia, India that microenterprises formed from local communities are involved in the road maintenance activities, empowering the people it serve. People therefore somehow feel proud that they have contributed to the maintenance of their roads.

4. Promote the creation of specialist micro-enterprises to specialise in those activities that require their skills.

Through this initiative, multiple micro-enterprises specialising in patching, demarcation/fencing and repair or construction of drainage works and other specialists ancillary works have been produced or formed. This decision has proved to be beneficial to the country as a whole since in cases of emergency, these specialists micro-enterprises undertakes the works much quicker and efficiently saving money for that country.

5. Modernization and institutional strengthening (in the organizational structure), for the proper management of the maintenance of rural roads.

This issue reluctantly and very complicated has been exposed by some administrators of roads and in some cases it has been successful and it is important that these experiences be known by decision makers.

1.3.3 Working Group 3

For this sub-theme, promotion of sustainable systems of rural roads maintenance, the information was sought through surveys from countries through the members of the Committee.

similarly to sub-theme 1, once the information was received a detailed analysis of this information was undertaken. The information supplied varied in the form it was presented.

Because of the small number of surveys that were received and that these surveys were not requested with information to address all of the issues discussed under this sub-theme, the results are regarded as incomplete. utilising the available information the trend that was defined showed that, it is difficult to directly show the impact of lack of maintenance to other factors such as services or well being of the local population.

There are no direct financial benefits that can be used to justify the financial resources invested to the reconstruction and maintenance of rural roads. this problem makes it difficult for the decision makers to present return on investment for investing resources in construction and maintenance of rural roads. Financial model such as Internal Rate of Return or Return on Investment cannot be used to show how profitable it is to invest resources on rural roads.

According to the information received indicating the levels of investment that countries allocates to the maintenance of its rural road infrastructure; it was concluded that the allocated funds are not sufficient to meet all requirements of maintenance and reconstruction of the rural roads network.

This insufficient funding for rural road network is a vicious circle. This can be simply explained as follows, insufficient funds limits the maintenance of the road, this leads to accelerated deterioration of the network, this poorly maintained road network will require even more investment to correct it to acceptable standard. The poorly maintained roads reduces the road's level of service which makes the road less safe and increases the operation cost of cars using that road.

In this sense, the investment and the state of maintenance of the networks of rural roads in any country has a direct relationship to factors such as the road operation, level of service which affects transportation other basic needs costs, social and cultural divides due to poor movement of the villagers to visit their relatives.

In most countries, the rural roads are heavily used for agricultural produce. therefore their poor maintenance caused by insufficient funding impacts negatively on the quality of the produce that is in transit to the market in the city center. In some instances, the sensitive agricultural produce loses its quality to an unusable level e.g. squashed tomatoes due to poor road that links the towns with the farm or cultivation place.

There is a need to create a unique system that can be used to evaluate and justify the investment required for the construction and maintenance of rural road network. This system or model should not be similar to commonly used economic analysis models. It should factor in the following:

- The need and importance of communication with rural communities and intermediate structures (local governments),
- The need keep the rural roads in a good condition in order to reduce agricultural produce cost,
- The general transportation cost,
- The cost of suppliers of food and other basic needs from cities to the rural communities,
- Jobs creation to the local communities , this will reduce the burden of government by reducing government grant dependant households,
- Environmental impacts e.g. poor erosion control due to lack of funding,
- level of service, and
- vehicle maintenance or operation costs,

there are more factors that can be identified and some will be based on the geographical location of road network.

1.4 Regional group

In accordance with the blue guide with respect to the technical committees (TC), 2012-2015 cycle was chosen for promotion and the transfer of detailed knowledge of the technical committees, including the 2.5 Technical Committee, on various regional issues. Thus was created the Latin American technical group (GTI), which began working simultaneously with its corresponding Committee.

In several previous meetings, most representatives members of the GTI the AGEPAR participated in the meetings of the Technical Committee, in order to inform about the progress of the regional groups and ensure that the Group's contribution incorporated in the work of the Technical Committee.

On the other hand in Africa through AGEPAR members and non-members of the 2.5 CT have been gathered and carried out activities during the 2012-2015 cycle. Their output is reported back to meetings of the TC 2.5.

1.5 Meetings and international seminars

Plenary meetings and seminars held to date by the CT 2.5 were:

December 2011	Mexico City - Mexico	The PIARC World Congress
May 2012	Paris - France	Meeting of all delegates and members of the technical committees
November 2012	San Salvador - El Salvador	Seminar and meeting CT 2.5 Parallel meeting of DIRCAIBEA
May 2013	Rome - Italy	Meeting 2.5 CT
November 2013	Durban - South Africa	Seminar and meeting of the 2.5 CT 12 attendees
June 2014	Budapest - Hungary	Meeting 2.5 CT
July 2014	Vienna - Austria	Mid-term meeting for the World Congress in Seoul Parallel meeting of the strategic issue No. 2
December 2014	Rabat - Morocco	Meeting 2.5 CT
May 2015	Managua - Nicaragua	Seminar and meeting CT 2.5 Parallel meeting of DIRCAIBEA
November 2015	Seoul - South Korea	The PIARC World Congress

- 8 plenary meetings of CT 2.5 and 2 seminars in management 2012-2015.

Reports and publications

Routes / Roads: Special Edition "Country roads" management, N° . 362, 2014.

The articles published in the magazine Routes / Roads were as follows:

- Techniques of drainage of rainwater on unpaved roads
- Improving access to rural areas - Moroccan experience
- Planning management, preservation of rural roads - Benin rural road network designed conservation strategies - Mali
- Use optimal marginal materials according to the standards PG-3 - Spain
- The most important program of conservation of pavement for highways rural - experience in Mohave County
- Program dedicated to the basic network of road infrastructure - promotion of the sustainable conservation of rural road networks - Chile
- Technical solutions to maintain the roads unpaved - El Salvador

International seminars

1.6 International seminar of the 2.5 CT of the PIARC in San Salvador - El Salvador

Rural roads and development 28 and 29 November 2012

During the seminar, the road professionals from 14 countries around the world, gathered in San Salvador to participate in this international seminar of the PIARC on rural roads and development.

This PIARC seminar, has been very beneficial for the theme where the papers highlighted new technologies and experiences in several countries around the world. The technical tour was arranged to visit a rural road section that was recently maintained with three different soil stabilizers. The three types of stabilization of soils that this road was treated with were compared to each other according to 1) type of stabilization, 2) cost, and 3) the performance of the road in relation to time. This visit concluded the seminar.

The seminar included a total of 18 papers, of which 6 were members of the 2.5 of the PIARC Technical Committee and the rest of speakers from Latin American countries. The speakers represented the following countries: Mexico, Italy, Chile, Paraguay, Japan, El Salvador, Costa Rica, Benin, Guatemala, Nicaragua, India and Mali as well as JICA (Japanese cooperation)

The presentations were complemented by valuable panel discussion where all participants were given an opportunity to comment to the presenters and their presentation or ask questions to the presenters.

The facts confirm that this seminar has been a successful event which has undoubtedly contributed to the exchange of experiences and technologies.

The high participation to the seminar was highlighted in the evaluation, in which all aspects were rated with an average note between 4 and 5 on a scale of 1 to 5, with 5 being the highest rating.

1.7 International seminar of the 2.5 CT of the PIARC in Durban - South Africa

Rural Roads Maintenance 27-29 November, 2013

During the days of 27-29 November 2013, in the City of Durban, South Africa, the Seminar on "Rural Roads Maintenance", was developed and organized mainly by the South African National Roads Agency and the World Roads Association (PIARC). Also it was supported by National Department of Transport of South Africa, South African Institute Civil Engineering, Ethekwini Municipality, and South African Road Federation. About 160 people from more than 8 countries joined this international event.

The keynote address was made by Honorable Kwa-Zulu Natal MEC of Transport Mr. Willie Mchunu introduced by Ms. Lungile Madlala, Executive Director Roads at the City of Tshwane. The MEC's keynote address was followed by Mr. Roberto Sandoval, President of the Technical Committee (TC) 2.5 PIARC, to layout the objectives of the PIARC.

The seminar was divided into 6 sessions, covering various topics such as:

- Policies for rural roads,
- Maintenance strategies,
- Road safety,
- Development and upgrading of unpaved rural roads, and
- Implementation of best practices in rural roads
- Case studies.

Many presentations were of high quality and provided much practical information and knowledge. On the second day of the seminar a gala dinner was organized and it was attended by delegates and their partners. The gala dinner was held at the 2010 world cup stadium (Moses Mabhida Stadium) and the main speech was delivered by Councilor Maphumulo of Ethekewini Metropolitan.

In the closing ceremony, Mr. Sandoval and Mr. Dumisani Nkabinde, English Secretary of TC2.5 summarized the seminar and the representatives from visiting countries and South Africa expressed their gratitude to the organizers and all participants.

The technical visit to the site of rehabilitation of Provincial Road M4 between uMhlanga and eMdloti Interchange was organized on the first day of the seminar. The technical visit demonstrated the soil stabilisation process by machine as well as by utilising labour. other interesting aspect of this technical visit was to observe local specialist micro-enterprises rehabilitating slope that was disturbed by summer heavy rains. This project won an award for technical excellence from the South African institute of Civil Engineers.

The high participation to the seminar was highlighted in the evaluation, in which all aspects were rated with an average to high rating between 3,7 and 4,4 on a scale of 1 to 5.

Congress

1.8 World Road Congress, Seoul 2015

The four-year cycle of work between the world congresses they will conclude with a session of technical Committee, within the World Road Congress in November of 2015 in Seoul.

In November 05 the following topics will be treated as a result of the work done by the Committee technical 2.5 "Management of heritage road", specifically two reports relating to the themes of the Committee the Manual management of heritage and developed during the work cycle. The manual based on web, a powerful tool for beginners and experts, will be first described and shown online.

1.9 Other congresses

Presentation "Networks of rural roads and accessibility of rural areas" by the President of the CT engineer Robert Sandoval in the PRE XVII Congreso Argentino of Roads and Transit on November 3-6, 2014, Buenos Aires - Argentina

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**TECHNICAL COMMITTEE 3.1
NATIONAL ROAD SAFETY POLICIES
AND PROGRAMMES**

2012-2015 ACTIVITY REPORT

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Randall Cable, South Africa – Vice Chair
Robert Hull, United States – English-speaking Secretary
Annie Canel, France – French-speaking Secretary
Jesus Leal, Spain – Spanish-speaking Secretary
Julian Lyngcoln, Australia – Working Group 1 Chair
Josef Mikulik, Czech Republic – Working Group 2 Chair
Robert Ritter, United States – Working Group 3 Chair
Laurent Carnis, France
Juan Emilio Rodriguez Perrotat, Argentina
Yoshitaka Motoda, Japan
Paul de Leur, Canada
Roberto Arditì, Italy
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1. GENERAL AND CONTENTS

1.1. General

This PIARC Activity Report is to present an overview of the PIARC Technical Committee 3.1, National Road Safety Policies and Programmes, activities for 2012-2015.

1.2. Contents

This report will consist of:

- General information and content,
- Technical Committee meeting dates and locations
- Work programme and organization by work group,
- Seminars and participation in other events,
- bibliographical references.

1.3. Technical Committee meetings

- Meeting 1. April 2012. Paris, France
- Meeting 2. November 2012. Rabat, Morocco
- Meeting 3. April 2013. Gothenburg, Sweden
- Meeting 4. November 2013. Buenos Aires, Argentina
- Meeting 5. May 2014. Washington, DC, USA
- Meeting 6. October 2014. Rome, Italy
- Meeting 7. April 2015. Glasgow, Scotland
- Meeting 8. November 2015. Seoul, South Korea

2. WORK PROGRAMME AND ORGANIZATION

The initial organizing meeting was held in Paris, France, March 2012. Three Working Groups (WG) were created in order to carry out the necessary activities to give response to the questions raised by the issues of the Terms of Reference (see below).

2012 – 2015 Strategic Plan

TC 3.1 – National Road Safety Policies and Programmes

Issue 3.1.1 Road safety investments and planning	
<i>Strategies</i>	<i>Outputs</i>
Building on the efforts of TCs C.1 and C.2, of the previous cycle, identify and document approaches and strategies for making broad safety investment programme decision. Decision-making tools that include financial models, cost-benefit analysis approaches, and other investment tools are part of the scope.	Case studies of successful strategies and practices. Chapter content for the Road Safety Manual.
Issue 3.1.2 Methodological safety approach	
<i>Strategies</i>	<i>Outputs</i>
Identify and document strategies for taking a systematic, holistic approach to address safety features in need of improvement on road routes and networks.	Case studies of successful strategies and practices. Chapter content for the Road Safety Manual.
Issue 3.1.3 Land use and urban planning	
<i>Strategies</i>	<i>Outputs</i>
Develop strategies (including legal and political ones) for the integration of road safety in land use and urban planning especially in the context of linear settlements and new developments.	Recommendations for the integration of road safety in land use planning and urban development. Chapter content for the Road Safety Manual.

Then, members were invited to express an interest in each Working Group. Once the list of members of each WG had been completed, the Chairman asked for volunteers to lead each of the Groups. After having considered member proposals as well as their experience, the following members were elected as WG leaders:

WG1 (Road investments and planning): Julian Lyngcoln (Australia)

WG2 (Methodological Safety Approach): Josef Mikulik (Czech Republic) / Viceleader: Guro Rannes (Norway)

WG3 (Land use and urban planning): Robert Ritter (USA)

The working groups developed the scope of the Terms of Reference in each WG and to prepare a more detailed working plan.

2.1. Working Group 1 Road Safety Investments and Planning

Working Group1 – Chair Mr. Julian Lyngcoln

Paris, France concept and scope

The aim of this issue was how to make sure that effective road safety interventions gets adequate funding and how these funds are spent in an effective way. The working group should study the following two aspects:

- How we could obtain funding
- How we could allocate the funds.

Rabat, Morocco update

The working group will produce one technical report. In addition, the working group will address defined scope of Working Group, find case studies on funding activities and different funding models. This work is expected to include web conference for the WG members and begin to work on the report before the next TC meeting. The WG will use the existing network for surveys. However, there is a need to work on how report will work in the content of the RSM.

Gothenburg, Sweden update

The group is addressing the comments on the Secretary General regarding the scope. Revised the scope to broader context based on this comment. The group discussed funding models for direct investment including tools, sources, and evaluation. Also, discussed indirect investments, for example mobility projects, tools, and other approaches. Will focus on case studies to illustrate models. Discussed the table of contents, the material for the case studies, who to get case studies from. Next steps are to confirm scope, refine table of contents, format for case studies, case studies before. Also discussed added comments on content: direct funding – models for dedicated funding, source, institutional arrangements. Indirect – investment in infrastructure, how impact safety. How to maximize road safety funds regardless if direct or indirect.

Buenos Aires, Argentina update

The report from the working group will focus on two main areas: funding models where the investment is to improve road safety through infrastructure and methods for maximizing safety benefit of infrastructure improvement projects. The plan is for the report to contain case studies and example models.

Washington, DC, USA update

The working group is looking at how to apply tools and investment models to invest in road safety, particularly infrastructure. In other words, how to get the best outcome with the use of funding. Some ideas to consider are:

- Treat sites, get best benefit-to-cost ratio. Will that approach get us to the most efficient system?
- Having a safe system or vision zero philosophy will help us.
- What are the tools within developing countries with limited resources that will help us get there.

Rome, Italy update

The working group has agreed that the report from the working group will focus on two main areas. The first is to look at funding models where there is investment with the primary aim of improving road safety. The emphasis will be on investment in infrastructure. The second area will be to look at methods for maximizing safety benefit where there is investment in infrastructure but where safety is not the primary objective of the investment. The report will outline some typical models in each of these two areas and then use case studies to provide specific examples for the models.

2.2. Working Group 2 Methodological Safety Approach

Working Group2 – Chair Mr. Josef Mikulik

Paris, France concept and scope

This issue has to do with how the different jurisdictions address problems in a systematic way, that is, to identify and document strategies for taking a systematic, holistic approach to address safety features in order to improve road networks.

Rabat, Morocco update

The working group discussion concentrated on the scope, outputs and products of work group. It was considered that the RSM Chapter 10 the best fit and covers their work. Also, RSM Chapter 3 (main concepts in Road Safety Management) seem to have some application to the working group's effort. The members divided the work into 5 subgroups and will determine if the report should be one or multiple reports. It was decided that the WG will survey countries on their use of certain tools, like safety audits and do the evaluation on existing guidelines, or World bank directions.

Gothenburg, Sweden update

This group is addressing the Secretary General comments regarding inclusion of black-spot method. Revised first strategy including location of high crashes. Identified five strategies how to improve safety, high crash area, road safety audits/inspections, safety performance indicators, evaluation of measures and policies, systematic approach. Developed a timetable, and by Argentina will have first draft of report. Based on two levels of surveys, the group will obtain basic information from countries using these strategies. The second phase will have more detail on individual strategies in the countries. The group can start to draft a report based on this information. Currently requesting information from the committee members.

Buenos Aires, Argentina update

The group reported a very poor response rate from the survey sent out earlier. This has limited the potential for case studies to be included in the report. There are a few approaches being considered: send the survey again but more to a more targeted group, and specifically ask for case study examples. A more detailed follow-up survey idea is being dropped because of the low response rate. The need to move quickly is critical to meet the required timeframe for the report.

Washington, DC, USA update

So far the working group as identified several approaches that should be explored. The members expressed concerns that expectations for the survey were not as hoped. They had received 14 responses out of 38 members on the technical committee. Based on the current available information the WG is developing case studies on high-risk groups, improvement potential, and methods of road safety performance indicators.

Rome, Italy update

The purpose of the report is to present a series of methodological approaches that can be used to improve road safety. The methodological approaches cover a wide range of techniques that can be considered by agencies that are interested to improve road safety, with the techniques limited to interventions that target roadway infrastructure.

To assist in the description of the methodological approaches, a series of case study examples are also provided. It is hoped that two case study examples can be provided with each methodological approach, with one case study example from a low or middle-income country and the second case study example from a high-income country. The case study examples are generally very brief and used to introduce the concept, however, further references and resources are listed to allow for a more in-depth understanding of the case study.

2.3. Working Group 3 Safety and Land Use Planning

Working Group3 – Chair Mr. Rob Ritter

Paris, France concept and scope

This issue has to do with how governments make sure that the safety will be integrated into land use and urban planning. In other words, the objective will be to develop strategies for the integration of road safety in land use and urban planning, specially in the context of the linear settlements along roads and new developments.

Rabat, Morocco update

The working group will focus on case studies focused on land use decisions made at local levels. They are considering possible 10 case studies, identify candidate locations through request for volunteers. The members will identify candidate case studies location opportunities and then will need to collect information, photos, policy details. The members viewed RSM Chapters 3 and 6 are applicable chapters, possibly Chapter 7.

Gothenburg, Sweden update

Focusing report on case studies of land use planning and impact on roadway safety. The group is looking to other sources of information such as the World Bank, Transportation Research Board, and committee members. Distributed a questionnaire regarding land use policies and safety impacts to identify potential case studies.

Buenos Aires, Argentina update

The working group is using the seminar presentation as the outline for the report. A point that has developed it to consider how to address mitigation to existing poor land use problems. It is expected that the report would include information on existing land use planning policies from other countries. One special item of note was the idea of considering land use planning policies for other modes of travel like bicycles and motorcycles.

Washington, DC, USA update

The working group currently is developing the report on the relationship between land use and safety. However, it has been a struggle to find the right information and how to get the discussion started. It is hoped this report will kick off discussion on international level on what happens, what land use planning is done, and how those decisions are made at local and national levels. The WG is exploring how the development of a particular land use will impact road safety and the transportation system. How will densities of the development, the design and connections between how the land is used impact the transportation system.

Rome, Italy update

Unplanned communities create hazards for road users of all types generating unsafe conditions for motorists on the roadway and significant dangers for pedestrians, bicyclists and residents alongside or adjacent to the road. While the World Road Association continues to investigate options and recommendations for communities that already exist in these environments, Technical Committee 3.1 generates this report to explain the relationship between land use and transport planning and the need for determined, thoughtful planning processes to prevent unsafe road conditions from developing. Information in this report comes from contributions of the Technical Committee members and a literature review of international land use and transport planning research.

3. SEMINARS AND OTHER PARTICIPATION

Seminar on Road Safety National Policies and Programs

November 2013. Buenos Aires, Argentina

This seminar was organized by the Argentine Road Association in cooperation with PIARC. Members of TC 3.1 that made presentations were: Matts-Åke Belin, Julian Lyngcoln, Randall Cable, Rob Ritter, Guro Raines, Yoshitaka Motoda, Laurent Carnis, Jesus Manuel Chavarria Vega, and Juan Rodriguez Perrotat. The TC had hoped for more case studies to be presented in order for the working groups to gather more information for their reports.

Joint meeting of the Transportation Research Board Committee on Transportation Safety Management (ANB10) and PIARC TC 3.1 – National Road Safety Policies and Programmes.

May 2014. Washington D.C., USA

This was the first ever meeting between a PIARC technical committee and a TRB standing committee. Presentations were made by the PIARC TC 3.1 working groups and by several of the TRB ANB10 subcommittees. Discussion centered around the continuity of safety issues being addressed by both committees.

European Workshop “A United Europe for Road Safety”.

October 2014. Rome, Italy

PIARC delegates were invited to the European Workshop hosted by the Italian Police Academy in Rome. A number of presentations were given by officials from the Italian National Police, EU Commissioners and from the Italian Ministers of Transport and Internal affairs. The agenda was divided in to four different themes, starting with “Towards a common European area of road safety” and followed by “Cross borders to save lives” during the morning session. During the afternoon session the themes “Roads of Italy, Roads of Europe” and “Loud and clear: the core of the message” were given with various international presenters. From PIARC Matts-Åke Belin talked on the subject “Vision Zero,

current frame and perspectives” and Roberto Arditi on the subject “Copy the message – Public communication and road safety”.

Joint meeting with PIARC, CEDR and the Italian police and transport authorities

October 2014. Rome, Italy

Dedicated to information regarding the work of the PIARC TC 3.1 as presented by the WG leaders of the different tasks in addition to presentations by, among others, Mr. Herman Morning from CEDR as well as Dr. Luciana Tonio from Rome University (La Sapienza) and Mr. Andrea Manfron with colleagues from the Association of Italian Motorways.

**Prepared abstracts and reviewed articles for Routes/Roads Magazine No. 359 2013
3rd Quarter**

Articles by Matts-Åke Belin and Randall Cable:

Advancing Road Safety Management: the New Standard ISO 39001

Matts-Åke Belin

Key Focus Areas in Road Safety Communication Campaigns

Randall Cable

Article reviews by Robert Hull

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**TECHNICAL COMMITTEE 3.2
DESIGN AND OPERATION
OF SAFER ROAD INFRASTRUCTURE**

2012-2015 ACTIVITY REPORT

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1 INTRODUCTION

The Activity Report presents an overview of the activities carried out by PIARC Technical Committee TC3.2 on the Design and Operation of Safer Road Infrastructure during the 2012-2015 session.

2 WG 3.2.1 WORK PROGRAMME AND ORGANIZATION

Issue: 3.2.1 Vulnerable Road Users (VRUs)		
Description of the selected strategies	Building from the efforts of TC's C.1 and C.2 of the previous cycle, and the Technical Sheets of the Road Safety manual: <ul style="list-style-type: none"> Create guidelines for safer urban and interurban roads with the focus being on the needs of vulnerable road users including pedestrians, young people, cyclist, motorcyclists and others 	
Working group leader	Xavier Cocu, Belgium; Marion Doerfel, Switzerland	
Cooperation within PIARC	PIARC Edition Team; TC 3.2.2 and 3.2.3, Task Force Revision of Road Safety Manual	
Cooperation with other organisations	Interaction with different National Committee through members	
Outputs		Calendar
Technical reports	Vulnerable Road User matrix Revised Road safety Audit Guidelines and Road safety Inspection Manual Road Safety Manual revision	February 2014, Mid 2014 Thro November 2015
Articles for Routes/Roads		
PIARC international seminars	Zimbabwe Warsaw, Poland New Delhi, India	May 2013 Sep/Oct 2013 Nov 2014
Other events	Sub Group meetings TC meetings Slovenia Belgium Scotland	Every 4-6 months Oct 2012 May 2014 April/May 2015
Sessions at XXV World Road Congress		2-6 November 2015

As a first step the working group (WG) decided to develop a PIARC common agreed definition of VRUs. The WG used the internal resource of its members, reviewed relevant references and consulted with subject experts. The aim was to specifically address the safety issues faced by VRUs in the low and middle income countries (LMICc); For example the WG surveyed the ASANRA group during a joint meeting in Victoria Falls in May 2013.

Having agreed a definition and identifying sub-groups of VRUs' working group reviewed a number of the more recent PIARC guidelines using this new definition. In particular a complete chapter of the "Catalogue of Design Safety Problems and Potential Countermeasures" and the "checklists" provided with the PIARC Road Safety Audit and Road Safety Inspection guidelines were revisited to include additional important issues faced by the various VRUs' sub-groups.

2.1 OUTPUTS

The Working group have developed a Technical Report addressing VRUs safety issues associated with design of the road infrastructure. Initial chapters of this report concentrate on the identification of main types of vulnerable road users and consider several VRU sub-groups. Another is an update of the chapter of the PIARC Catalogue of Design Safety Problems and Potential Countermeasures (2009R07). Another part of the report "RSA & RSI checklists addressing VRUs problems and needs" is an update of the checklists provided with the manuals 2011R01 and 2012R27.

2.1.1 A definition of vulnerable road users

Walking and cycling are transport modes where relatively unprotected road users interact with traffic of high speed and mass. This makes pedestrians and cyclists vulnerable. They suffer the most severe consequences in collisions with other road users because they cannot protect themselves against the speed and mass of the other vehicles.

Compared to cars, powered two-wheelers (PTWs) are less stable, less visible and offer less protection to the driver. All around the world they are involved in a disproportionately high percentage of fatal and serious accidents. This makes mopeds riders and motorcyclists vulnerable.

Similarly, slow and small agriculture vehicle as well as animal drawn vehicles often experience severe consequences in collisions with motorized traffic, due to speed differences and because of their relative un-protection.

Consequently the working group adopted the following definition:

The "vulnerable" road users are those road users who are at great risk because of a lack of enough physical protection or because of relative high speed difference with potential conflicting modes.

Using this definition the working group focussed on four main categories of road users: pedestrians, cyclists, riders of powered two-wheelers, as well as light duty farm vehicles or animal drawn vehicles.

However within these main groups exist a large variety of sub-groups: Children, Elderly, Persons with impaired mobility; Pedal operated cycle, electric (assisted) cycles; Mopeds, Motorcycles, Scooters, Other 3-wheelers and quads; Slow agriculture vehicle without protection, Animal drawn vehicles and their passengers, Street vendors, Animal riders. Each of these groups are described in the technical report.

2.1.2 Design safety problems for VRUs and potential countermeasures

In 2009 PIARC published a “Catalogue of Design Safety Problems and Countermeasures” aimed at developing and emerging countries and countries in transition. The catalogue gives brief information about well-known design errors, suggests a range of methods to overcome these and gives an indication of the comparative countermeasure costs to facilitate prioritization of the work. The catalogue can be used both as a proactive safety tool to ensure the design faults do not arise in the first place, or a reactive safety tool to assist in designing cost-effective countermeasures where problems already exist on the road network.

The sections of these guidelines are further divided into specific problem areas; one section being dedicated to VRUs, more particularly safety problems as faced by pedestrians and cyclists. In view of the definition of VRUs adopted above a review of this section of the catalogue has been conducted by the WG during the 2012 - 2015 cycle.

Using this approach Design/Treatment are described and illustrated. Benefits/Effects are listed (i.e. what VRUs will likely benefit from the measure) and as far as possible Cost and Implementation issues are discussed (cf. example hereafter).

6.03 PROTECTION OF CYCLISTS AT INTERSECTIONS


Problem: Cyclists are often given little consideration at intersections in regard to their vehicular rights and particular vulnerability. This scenario exposes them to motorised traffic that is often travelling at relatively higher speeds. A high percentage of cyclist accidents occur at major/minor priority intersections.



Treatment types & costs		Crash types
T1: A sign-posted alternative cycle route away from the junction	\$	<ul style="list-style-type: none"> · Cyclist-motor vehicle collisions · Cyclist-pedestrian collisions
T2: Modify the layout of the intersection to cater for the cyclists	\$	
T3: Signalising the whole intersection	\$\$	Affected users
Should be used if the volume of cyclists is significant, but not high enough to justify economically a grade separated crossing		<ul style="list-style-type: none"> · All road users particularly cyclists
T4: Increase vehicle deflection on entry to roundabouts to a reduce approach speeds	\$\$	
T5: Pre-start in time / area for cyclists	\$	

Design/Treatments & Their Benefits

T 1: Alternative provision for the cyclists through separation from motorised traffic

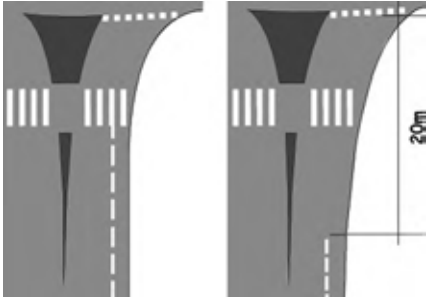


T2: Modify the layout of the intersection to cater for the cyclists

By reducing the number of potential conflict points, as compared to an at-graded junction, the introduction of a roundabout often provides great safety benefits for motorised traffic. However the safety of VRUs, and particularly cyclists, may remain a critical issue if their needs are not appropriately taken into consideration.

Typical conflict points for cyclists at roundabouts are at the entry and the exit.

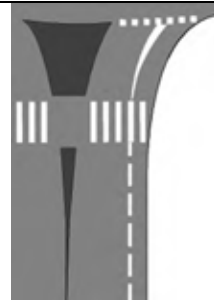
The safety of cyclists on roundabouts is best ensured on small roundabouts (radius less than 15 m), with a single lane at each entry or exit branch, sufficient path deflection to avoid direct vehicle paths, low radii at entries and exits, and appropriate ring width (around 7 m for single-lane entries).



Cycle lanes in the ring should only be considered for medium-size roundabouts (outside radius between 15 and 22 m), in continuity of existing cycle lanes on either side of the intersection.



Source: CETE Méditerranée



Source: CERTU, "Vélos et giratoires", 2009

For large roundabouts or complex traffic situations (speed, heavy ground vehicles), the safest approach is to remove the cycle lane/path outside of the roundabout.

T3: Signalise the whole intersection.

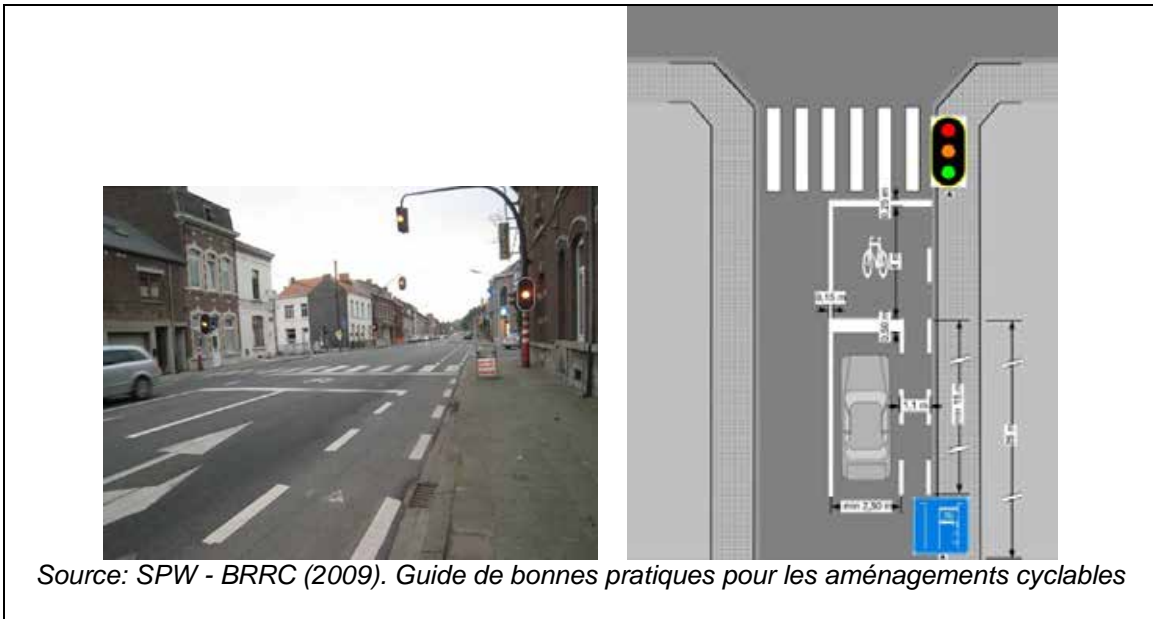


T4: Increase vehicle deflection on entry to roundabouts to reduce approach speeds



T5: Pre-start in time / area for cyclists

At traffic lights regulated intersection, the introduction of a pre-start area dedicated to the cyclists may be used to facilitate their left-turning movements and to improve the visibility conditions between cyclists and motorized vehicle drivers. This area should be marked across the entire lane width and be long enough to allow cyclists stopping. The cyclists should be allowed easy access this area, even when motorised vehicles are already stopped in front of the traffic lights; depending on the lane width and the type of cycleway preceding the intersection, the access will be facilitated by a marked cycleway (picture) or simply by cycle pictograms and arrows. Appropriate road signs are also recommended to inform drivers.



Extract of the updated Catalogue of Design Safety Problems and Countermeasures

2.1.3 RSA/RSI checklists addressing VRUs problems and needs

The former road safety technical committees of PIARC produced Guidelines on Road Safety Audits (RSA) and on Road Safety Inspections (RSI). These guidelines have a unique structure in respect of the road characteristics to be checked and analysed and propose detailed checklists to assist both the RSA and RSI procedures.

Parts of these checklists address safety issues faced by vulnerable road users, more particularly safety problems as faced by pedestrians and cyclists. In view of the definition of VRUs adopted above a review of these checklists has also been conducted by the WG during the 2012 - 2015 cycle to better account for the VRUs sub-groups.

3 WG 3.2.2 WORK PROGRAMME AND ORGANIZATION

Issue: 3.2.2 Revision of the Association's Accident Investigation Guidelines	
Description of the selected strategies	Review the Association's existing Accident Investigation Guidelines for engineers and the Human Factors Guidelines to identify knowledge gaps and opportunities to upgrade and update the content.
Working group leader	Daniel Aubin, Canada-Quebec; Sibylle Birth, Germany
Cooperation within PIARC	PIARC Edition Team; TC 3.2.1 and 3.2.3, Task Force Revision of Road Safety Manual
Cooperation with other organisations	Interaction with different National Committee

Outputs		Calendar
Technical reports	Final Edition (English Version): Human Factor in Standards: Audit Results and Best Practices (final title still in decision) Final Edition (French Version) : Facteurs humains dans les normes: Résultats de l'audit et meilleures pratiques (final title still in decision) Final Edition (English and French Version) Human Factor Principles of Spatial Perception for Safer Road Infrastructure Revised Road Accident Investigation Guidelines for Engineers	November 2012, Beginning 2013 Beginning 2013 Fall 2014, edition till WRC
Articles for Routes/Roads	Human Factor Principles : Spatial Environnement influences on Drivers	Winter 2013
PIARC international seminars	Seminar to be confirmed, Zimbabwe Seminar to be confirmed, Warsaw, Poland	March 2013 December 2013
Other events	Group meetings Lectures during PIARC Special Session aside 11 th Slovenian Road Congress (Internal Training) Basic principles of Human Factors and accident prevention (Internal Training) Reviewing Accident Investigation Methods and Guidelines (to be confirmed) Conference and participation International Baltic Road Conference, Vilnius Lithuania	Every 4-6 months October 2012 January 2013 in Potsdam July 2013 in Czech Republic 26-28 August 2013
Sessions at XXV World Road Congress		2-6 November 2015

This working group proposed a completely new approach to investigate accidents and integrate Human Factors in the process. The report will be presented during the Seoul 2015 congress.

In addition, some members were involved in the continuation of work from the last cycle. "Human Factors in Roads Design. Review of Design Standards in Nine Countries" (PIARC 2012R36EN) was translated in French. The old Human Factors Guideline has been revisited and produced in English, French and Spanish (in progress translation).

Finally, leaders from the workgroup were involved in the revision of certain chapters for the new Road Safety Manual (RSM), principally those related to the Man-Road Interface.

As the workload was significant and additional meetings were held to achieve the goal and deliver all the required outputs . .

At the first meeting, members were invited to decide in which subgroup they wished to participate.

Members shared their experience within the RSM Users Group, and will continue to be the link to ensure the chapter related to Human Factors and Accidents will be in accordance with PIARC vision and requirement for references defined in documents in preparation.

A separate writing session was held between members involved in deliverable from past cycle to define and split the work to produce a final document ready for edition.

A special Human Factors training session was held in Potsdam, Germany in January 2013

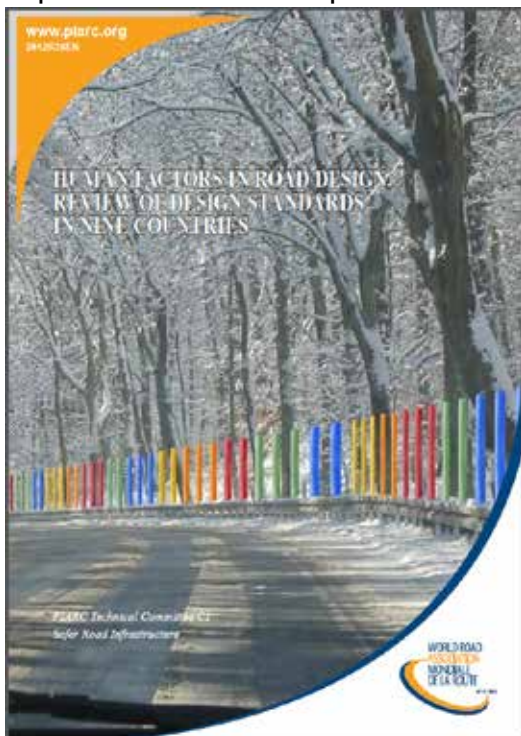
Since the mandate of the workgroup was to integrate Human Factors in the Road Accident Investigation Guideline, it was decided that all members should have the same level of understanding of Human Factors.

During the Road Safety Seminar organized by ASANRA a questionnaire was presented which was designed to assist the workgroup to adapt and include the needs and requirement from Low and Middle Income Countries (LMICs). Results from Countries participating to the seminar are included in the minute of the meeting.

A further special Writing Session held at the University Of Florence in July 2013

During this session the table of contents was fully agreed. All members were assigned their chapter to write and the detailed framework for the new RAI was ready and accepted by members present to the session.

During the Seminar in Poland in October 2013 a special workshop was also held to share experience from the experts of our workgroup with our Polish colleagues.



The workgroup met two days before the Technical Committee Meeting which was being held in Brussels, for a further writing session.

Prior to the Technical committee meeting which is to be held in Glasgow, members of this workgroup will convene for a final writing and revision session.

3.1 OUTPUTS

Human Factors in Roads Design. Review of Design Standards in Nine Countries

In the previous World Road Association cycle from 2008 to 2011, the "IST Checklist 2008" was used to identify the degree to which Human Factors items are explicitly or implicitly addressed in 9 countries' current national design standards and guidelines for rural distributor roads. The checklist contains about 100 validated Human Factors (HF) criteria

especially for spatial perception. Guidelines from these countries were examined:

Portugal, Canada, Australia, Japan, China, Hungary, Czech Republic, France and the Netherlands. The workgroup, principally those from the last cycle, participated to the last and final validation of the English Version of the document “Human Factors in Roads Design. Review of Design Standards in Nine Countries” 2012R36EN.

The workgroup finalized the translation of the document into French..

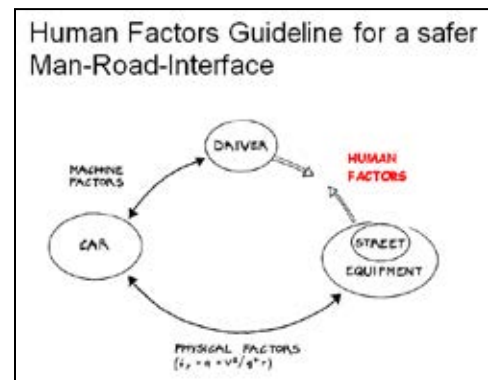
Human Factors Guideline for a safer Man-Road-Interface

The First version of the “Human Factors Guideline (HFG) for Safer Road Infrastructure” was edited by PIARC (2008R18).

During the preceding cycle, a substantial amount of work was done to prepare the review of design standards required to verify the meaning and the wording of the HFG. This will provide a better understanding for road engineers. In the same time the group decided to revise entirely the guide. In this cycle, members of this workgroup continued their work on the revision of the HFG.



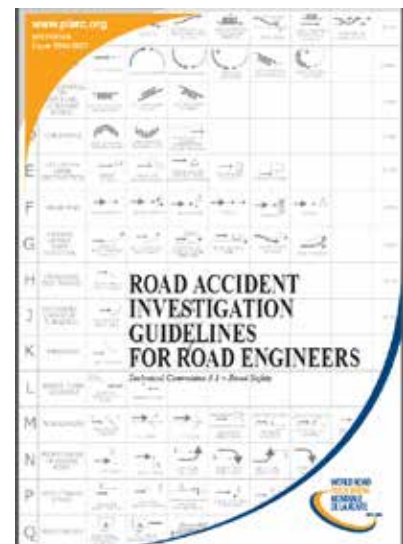
The final edition was prepared and the document will be available entitled: “Human Factors Guideline for a safer Man-Road-Interface”. The group helped by collaborators from the last cycle produced the English and French version. The Spanish version is still being prepared



Road Accident Investigation Guideline

The existing guideline for accident investigation by road engineers was published by PIARC in 2007. The workgroup feels strongly that the state of the scientific and technical knowledge regarding the psychological and physiological limits of road users (Human Factors of the Man-Road-Interface) must be brought together and be integrated.

This opens a new approach for using accident data. Traditionally accident data describes human misbehaviour in terms of violation of traffic rules. This results in the primary focus of strengthening countermeasures around education and enforcement of road users. It is also concentrates more on avoiding severe consequences of accidents. Consequently many useful countermeasures leading to forgiving road designs have been developed.



But this practice is still missing the interaction between design features of the road and their effect on the road users. Therefore there is a danger that accident analysis and on-site inspections are will not be able to explain accidents even where the design is to the standards. Very often, in such cases, human mistakes are instigated by misleading and/or unexpected road features.

So the classification of accident types is important but not sufficient in itself. They describe the situation at the end of a chain of incorrect actions and driving manoeuvres. They can provide a hypothesis about the cause or the trigger of the accident for the on-site inspection. The development of effective countermeasures requires the investigation of the accident causes. Specifically it is necessary to identify the real accident trigger – the starting stimulus of a chain of actions which results in an accident.

Within this causes the psychological and physiological threshold values of human abilities play a very important role. It has to be detected by special Human Factors on-site inspection to identify which human abilities and limits had been overstressed or violated, so that the road user had no chance than to make mistakes.

The WG are planning to complete the English version during the meeting in Glasgow. French version will be translated after completion of English.

Participation on the new Road Safety Manual

One of the mandates of this workgroup was to participate in the review and updating of the RSM.. Chapters on accidents in the original version of the RSM were referenced in the original Road Accident Investigation Guideline. Our verification was to be sure all references required in our document still exist in the new RSM.

4 WG 3.2.3 WORK PROGRAMME AND ORGANIZATION

Issue: 3.2.3 Driver distraction and fatigue		
Description of the selected strategies	Identify and document successful strategies for addressing driver distraction and fatigue with the focus on engineering solutions (including road infrastructure, vehicle and road design solutions).	
Working group leader	Brendan Marsh, Australia; Pierre Anelli, France	
Cooperation within PIARC	PIARC Edition Team; TC 3.2.1 and 3.2.2, Task Force Revision of Road Safety Manual	
Cooperation with other organisations	Interaction with different National Committees, REAAA, IRF and AASHTO	
Outputs		Calendar
Technical reports	Draft outline structure of the detailed technical report.	November 2012
	Principles governing engineering solutions to driver distraction and fatigue together with explanatory text for the Road Safety Manual.	September 2013
	Technical report: Relevant existing	First draft, September 2014
		Finalised report,

	literature, the domain of engineering solutions, principles, engineering solutions and case studies across the LIC to HIC spectrum.	June 2015
Articles for Routes/Roads	Engineering Solutions to Driver Distraction and Fatigue – the activities of TC 3.2, Workgroup 3.	June 2013
PIARC international seminars	Zimbabwe and Poland 2013 : Engineering Solutions to Driver Distraction and Fatigue – Workgroup 3 presentation and workshop	April and December 2013
Other events	Group meetings and lectures during PIARC Special Sessions at further future meetings Conference and participation International Baltic Road Conference, Vilnius Lithuania	Every 6 months 26-28 August 2013
Sessions at XXV World Road Congress		2-6 November 2015

After finding that most driver distraction and fatigue material related to improving driver behaviour, the workgroup considered the Safe System approach to road safety and the role of engineering in the case of driver distraction and fatigue. This identified that where engineering achieved a safe system ideal outcome, the fatal and serious injury crash risk associated with driver distraction and fatigue would also be eliminated. It also identified that the human factor work previously undertaken by PIARC could be built upon to promote road design techniques that combat driver distraction and fatigue.

4.1 OUTPUTS

The Workgroup has developed a technical report addressing the road engineering response to driver distraction and fatigue. The chapters consider the different types of driver distraction and fatigue, best practice road safety and the role of engineering, the role of engineering in combating driver distraction and fatigue and examples of driver distraction and fatigue risks and countermeasures.

4.1.1 An examination of the role of road engineering

With most of the literature focusing upon improving driver behaviour so as to encourage avoidance of driver distractions and regular breaks to avoid fatigue, the Workgroup found that road engineering guidance for mitigating driver distraction and fatigue risks is currently limited. The limited nature of the literature probably reflects past approaches to road safety which tended to compartmentalise different types of problems rather than considering a system approach to enable all components of the road system to contribute to their mitigation.

Accordingly, the role of road engineering to mitigate driver distraction and fatigue risks was examined.

Under the Safe System approach, the priority is to prevent fatal and serious injury crash outcomes which is rather different to simply trying to prevent crashes occurring. The approach accepts that crashes are inevitable because humans have physical and cognitive limitations and are fallible – we make mistakes, take risks and sometimes choose to do the wrong thing (e.g. exceed the speed limit). Previous work by the Workgroup

Leader had overlaid the fatal and serious crash prevention priority onto Reason's Swiss Cheese Model, to provide a model for achieving a Safe Road System – see Figure 1.

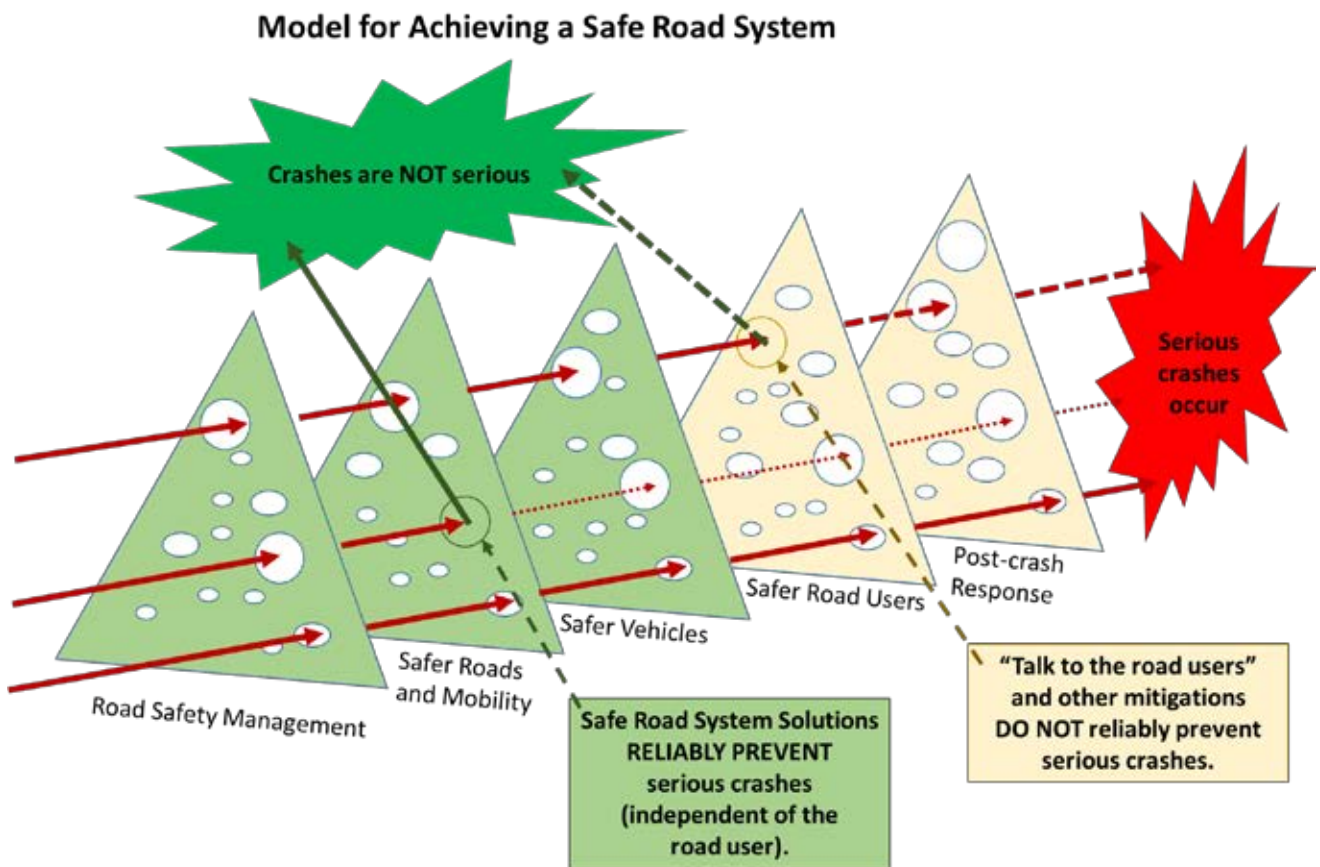


Figure 1: Model for Achieving a Safe Road System

In this model, each pillar of road safety is assumed to have weaknesses that could lead to a fatal and serious crash outcome. The goal is to most effectively block potential fatal and serious injury crash outcomes by leveraging the most feasible alternatives with a system approach.

The model further recognises that Safer Road Users and Post-Crash Response pillars of road safety offer much less reliable alternatives for preventing fatal and serious crash outcomes. While a road system, road and vehicle design is reviewed and checked and reviewed again by experts in the field, drivers are in the heat of the moment making on the spot decisions for which the consequences are born before any review can occur. The post-crash response is after the event and while more rapid and effective medical attention may help to improve healing and survival rates, it is after the event.

In the case of driver distraction and fatigue, aspirational safe system road and vehicle design can prevent fatal and serious crash outcomes nearly independently of driver behaviour. For example, a high performance road safety barrier system will not prevent a crash but will spread the energy dissipation over a longer time period to result in the crash being survivable by all those in a vehicle of reasonable safety standard. For example, traffic calming measures can limit the speed reached by a vehicle and even disable a vehicle seeking to reach speeds where fatal and serious injury outcomes become likely. For example, roundabouts with speed reducing approaches that prevent over-speeding vehicles from even reaching the conflict point can virtually eliminate intersection fatal and serious injury crash outcomes. For example, the future promises advanced technologies

which can assist with the prevention of crashes through cooperative infrastructure and vehicle communications – road authorities should advance their planning for such technologies and start making real time operational information available in real time (such as the next traffic signal change or the current speed limit).

Therefore, at the highest level, the role of road engineering is to target road designs which generally keep crash energies to within the human tolerances for serious injury and death.

The most internationally accepted thresholds are:

- 70km/h for lane departure (head on, run off road and roll over) and rear end crashes
- 50km/h for approximately 90 degree side impact crashes
- 30km/h for unprotected road users.

Where these crash risks are mitigated, much higher speeds can be rather safely accommodated, such as on motorways lined with high performance road safety barrier (located close to the traffic so potential high energy impact angles are minimised) equipped with managed motorways Intelligent Transport Systems that adjust operations when time specific risks arise (e.g. a broken down vehicle, traffic congestion, unfavourable weather, etc).

Any road or network can be quickly assessed for locations where these thresholds are potentially exceeded and road engineering measures can be identified which can generally keep crash energies within the thresholds.

However, there is an extensive existing road network for which treatment in a short period of time is not feasible and locations where complying with the human tolerances would create broader safety or health risks (due to the mobility constraints imposed). Further, as a second order priority, the road design should seek to avoid contributing to driver distraction and fatigue crashes generally.

Therefore, the Workgroup took a closer look at driver distraction and fatigue in order to uncover ways that road engineering can help reduce the risk of either being a crash factor.

4.1.2 An examination of different types of driver distraction

There are a number of sources of driver distraction and ways to categorise driver distraction such as:

- External to the vehicle versus internal to the vehicle, such as other passengers, vehicle comfort controls and electronic devices like mobile phones;
- Matters of the mind such as day dreaming;
- Other messages that over compete critical road signage for the driver's attention, be that roadside advertising or poorly set-out, maintained or designed road signage;
- Scenic landscapes, art forms and structures;
- Unusual events and incidents.

However, to avoid monotony fatigue drivers need to be kept activated and a valid technique for improving driver activation is to arouse the driver's attention such as with a roadside public art work that deliberately captures the attention of the driver.

Further, it was determined that driving a vehicle comprises multiple tasks. A driver cannot check their speed while simultaneously reading a roadside sign. A driver cannot be checking the rear view mirror while scanning the road ahead. In order to collect the information needed to build a picture of the driving situation within the driver's mind, the driver is constantly moving from one driving task to another.

If a driver fails to update an aspect of the driving situation within their mind model, they become more at risk of incorrect decision making.

A novice driver usually finds the driving task challenging because they are not yet efficient and collecting and processing the necessary information.

A respected cognitive scientist, Kahneman, suggests the idea of conscious versus subconscious operations of the brain. The conscious processing has limited capacity, however, is adept for tackling matters that a person is not accomplished and orchestrating complex tasks such as driving which really comprise a large collection of sub-tasks. By contrast, the subconscious processing capacity seems to only be limited by the information available to it and becomes available to a person as they become accomplished at performing a task.

A novice driver struggles to drive a vehicle because they haven't sufficiently accomplished gear changing, steering and all the other sub-tasks of driving meaning the conscious brain's capacity is being challenged and exceeded because it has few subconscious routines to call upon. By contrast, an accomplished driver can be at risk of monotony fatigue because the majority of the driving task is being performed subconsciously and the conscious brain having extensive spare capacity to an extent that it is getting bored.

Driver distraction is, therefore, not a black and white matter. Whether something beyond the road-scape becomes a distraction depends upon whether it is taking the driver's attention away from the road for so much time that their model of the driving landscape is no longer sufficiently accurate.

Talking on a mobile phone or writing an email or message while driving is particularly dangerous because these activities can require significant and extended focused attention of the driver, compromising their mind's model of the road-scape and ability to make good driving decisions.

A display with numerous changing screens or moving images can prevent a driver from keeping up to date with other driving inputs, which is why many best practice guidelines for Variable Message Signs limit the amount of text used and the number of screens.

A standout public art piece can be a very good thing along an otherwise "boring" road-scape from the perspective of an accomplished driver, however, it becomes a distraction if it competes for the driver's attention with a critical road safety risk, such as an upcoming intersection, because the driver may not even detect the intersection.

So, for a matter to be considered a driver distraction, it must capture the conscious attention of the driver for a sufficient duration such that the driver's model of the road-scape is no longer sufficiently accurate. Also, the relevant duration depends upon the specific driving context as the duration might be negligible in a busy road environment or one unusually affected by an event or roadworks where all drivers need to devote all of their attention to the road. On the other hand on a long and straight lowly trafficked stretch

of remote road with very good visibility ahead and to the sides of the road, the allowable duration before a matter becomes a distraction might extend well into the seconds.

Further scientific research is required to better quantify the allowable duration for a range of road environments.

However, for broad guidance:

- Important road signage should be designed to stand out from the background so that it outcompetes competing messages
- Messages and scenery that compete for the driver's attention should be avoided at "busy" road locations where the full attention of the driver must be on the road.
- Competing messages and scenery may be appropriate where accomplished drivers have substantial surplus conscious attention
- The roadway should be assessed for potential deceptions that might cause a driver to assess that the road ahead is different to reality (e.g. street lighting or the tree line might indicate the road moves in a different direction) or safer than it really is (e.g. geometry or vegetation may obscure an intersection or driveway ahead).

4.1.3 An examination of different types of driver fatigue

A number of classifications of driver fatigue were examined by the Workgroup.

Monotony fatigue is associated with the driver becoming bored due to lack of stimulation. An obvious example is the long and straight road way where the speed limit feels to the driver to be too low. Effectively, monotony fatigue becomes a significant road safety risk on a roadway where the driver does not feel centrifugal forces at the bends, has little decision making being demanded of them and has little to arouse their interest (e.g. an unchanging landscape).

To combat driver fatigue, both sensory and cognitive stimulation should be used to keep the driver optimally activated to maximise their performance of the driving task.

The latest German autobahn design approach is considered to be at the fore front of preventing monotony fatigue because they:

- Seek to prevent straights exceeding 1km in length;
- The geometry is consistently tight so that the driver does feel the centrifugal forces, however, is not at risk of being surprised by a tighter than usual bend;
- Changes in landscape and scenery are sought, such as taking advantage of opportunities to break the road out of a forest to open an expansive view and before too long returning the carriageway to the narrower perspective of the forest;
- Adding public art or advertising messages through boring sections away from the major road safety hazards;
- Preparing drivers for approaching major hazards at least 7s travel time in advance of them.

Further scientific research is required to further advance these developments and provide better guidance for reducing the driver's risk of deactivation and monotony fatigue in any given environment.

Another form of fatigue is related to monotony fatigue, however, is the opposite of it. This is when the driver becomes overwhelmed by the road environment or asked to consciously work very hard resulting in the driver quickly tiring. In general terms, this form of fatigue is less common in accomplished drivers, however, very common in novice drivers, simply due to them needing to expend much more conscious attention as they build their automated driving skills.

However, there types of roads and situations which create the risk of the driver being overwhelmed or tiring very quickly. Types of roads such as hazardous mountain passes on poor quality pavement or tracks can be exceptionally demanding. Where possible, rest areas should be provided that encourage drivers to take a rest. For example, the rest area might be complemented with an exceptional scenic view.

Traffic conditions can also deteriorate due to adverse weather or overwhelming demand. In these cases the operations of the roadway should be adjusted to better suit the prevailing conditions. For example, freeways should be equipped with variable speed limits to enable the speed to be lowered whenever operational risks arise so as to reduce the driver's demand on the conscious brain to reasonable levels.

General tiredness is another form of fatigue. Attractive rest opportunities should be regularly provided along all road systems. This might involve motorway service centres or simpler rest areas, however, where possible, simpler rest areas should coincide with something that is enticing to the driver. Rest areas exposed to the worst of the weather are too often overlooked by drivers.

4.1.4 Summary

Road engineering has a key role to play in mitigating driver distraction and fatigue risks. At the highest level, road engineering measures can be applied to prevent fatal and serious injury crash outcomes even with the presence of driver distraction and fatigue.

Road engineering can also reduce the risk of driver distraction and fatigue crashes occurring by designing roadways that manage the activation levels of drivers, keep possible distractions away from demanding road environments and provide attractive opportunities for regular driving breaks to be taken.

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**TECHNICAL COMMITTEE C.3.3
ROAD TUNNEL OPERATIONS**

2012-2015 ACTIVITY REPORT

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Marc Tesson	French speaking secretary
Fathi Tarada	English speaking secretary
Pierre Schmitz	Vice-chairman and past-chairman
Javier Borja Lopez	Webmaster

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EU commission

1. WORK PROGRAMME AND ORGANISATION

1.1. Introduction

During the 2012-2015 cycle, a lot of work has been undertaken to assemble best practice in the area of tunnel operations and management for improving safety of tunnels' users.

The terms of reference defined in the Strategic Plan for TC3.3 are:

- Sustainable road tunnel operations
- Integrated road tunnel safety
- Underground road networks
- Knowledge sharing on tunnel operations and safety

To undertake this work, the Committee set up six working groups, each commissioned to investigate and report on specific aspects of the work under consideration. The working groups included C.3.3 members as well as a number of experts who were not members of the Committee. C.3.3 steered, reviewed, discussed and approved the documents produced by the working groups. More details of these working groups are provided below.

C.3.3 met regularly as follows:

- | | |
|------------------------------|--------------------|
| · Paris (France) | 14-15 March 2012 |
| · Santiago (Chile) | 15-16 October 2012 |
| · London (U.K.) | 16-17 April 2013 |
| · Da Nang (Vietnam) | 21-22 October 2013 |
| · Andorra La Vella (Andorra) | 5-6 February 2014 |
| · Copenhagen (Denmark) | 7-8 October 2014 |
| · San Juan (Argentina) | 13-14 April 2015 |
| · Seoul (South Korea) | 2-6 November 2015 |

1.2. Working Group 1: Road tunnel operations

Leader:

Jean-Claude Martin, France

Secretary:

Véronique AURAND France

Active Members:

Urs WELTE	Switzerland
Alexander WIERER	Austria
John BURACZYNSKI	USA
Javier BORJA	Spain
Harald BUVIK	Norway
Ahmed KASHEF	Canada
Hideto MASHIMO	Japan
Gary CLARK	UK
Pierre SCHMITZ	Belgium
Frédéric HERVE	France
Yannick MALLE	France
Tshibela Arthur KABUYA	Belgium
Kristin VAN DER AUWERA	Belgium
Ronald MANTE	The Netherlands
Nikolaos VAGIOKAS	Greece
Fernando PORTUGES	Spain
Massimiliano FRESTA	Italy
Carlo BARBETTA	Italy
Wei LIU	China
Wah Onn Adrian CHEONG	Singapore
Nam-Goo KIM	South Korea

SP Strategy:

- Identify methods for ensuring sustainable road tunnel operations through the review of current practices and consideration of innovative approaches.

Expected outputs:

- Recommendations and case studies on sustainable road tunnel operations including cost, environmental and other issues to consider during the design, installation and maintenance.
- Best practice for life cycle analysis, both for new and existing tunnels.

Meetings (average number of attendees is 11):

- Lyon (France) 5th & 6th July 2012
- Brussels (Belgium) 4th & 5th October 2012
- Paris (France) 7th & 8th February 2013
- Athens (Greece) 5th & 6th September 2013
- Milan (Italy) 16th & 17th January 2014
- Windischbuch (Deutschland) 26th & 27th June 2014

1.3. Working Group 2: Feedback from experience on tunnel safety

Leader:

Bernhard Kohl (Austria)

Secretary:

Joe Figueredo (United Kingdom) & Kristin van der Auwera (Belgium)

Active Members:

Ioannis BAKOGIANNIS	Greece
Guillermo LLOPIS	Spain
Ciro CALIENDO	Italy
Niels Peter HOJ	Switzerland
Maria MARTON	Sweden
Harald BUVIK	Norway
Laura VAISANEN	Finland
Christophe WILLMANN	France
Joe FIGUEIREDO	Great Britain
Sonja WIESHOLZER	Austria
Josephine I'ORTYE	Netherlands
Philippe PONS	France
Pierre MERAND	France
Ulla EILERSEN	Denmark
Javier BORJA	Spain
Raphael DEFERT	France
Tineke WIERSMA	Netherland
Christian GAMMETER	Switzerland
Nikolaos VAGIOKAS	Greece
Bernhard KOHL	Austria
Luca STANTERO	Italy
Christoph ZULAUF	Switzerland
Alessandro FOCARACCI	Italy
Carlo RICCIARDI	Italy
Abraham CATALAN	Mexico
Pavel PRYBIL	Czech Republik
Miloslav Frankovský	Republic of Slovakia
Radim BAJGER	Czech Republic
Ronald MANTE	Netherlands
Jelle HOEKSMAN	Netherlands
Les FIELDING	United Kingdom
Ding HAO	China
Ulf LUNDSTRÖM	Sweden

SP Strategy:

- Draw lessons from current practice regarding safety management, the analysis of road tunnel accidents data and fires worldwide and application of risk analysis.

Expected outputs:

- Report from experience on tunnel safety (including accident data analyses and application of risk analysis) as a basis for risk management.

Meetings (average number of attendees is 18):

- Vienna (Austria) 13th September 2012
- Madrid (Spain) 29th January 2013
- Zürich (Switzerland) 6th & 7th July 2013
- Lyon (France) 30th Sept & 01st Oct 2013
- Stockholm (Sweden) 23rd & 24th January 2014
- Rome (Italy) 12th & 13th June 2014
- Amsterdam (Netherlands) 12th & 13th November 2014

1.4. Working Group 3: Human factors in tunnel safety

Leaders:

Marc Tesson, France
Olivier Martinetto France

Secretary:

Not applicable

Active Members

Joan Almirall	Spain
Ruggero Ceci	Sweden
Kristen Drouard	France
Magalie Escoffier	France
Michael Potier	France
Maartje de Goede	Netherlands
Nicole Hoffmann	United Kingdom
Martin Kelly	United Kingdom
Hans Kristian Madsen	Norway
Henric Modig	Sweden
Pavel Pribyl	Czech Republic
Jacques Salama	France
Jean Michel Vergnault	France
Arthur Kabuya	Belgium
Arnold Dix	Australia
Alexandre Debs	Canada - Quebec
Ioannis Bakogiannis	Greece
Hideto Mashimo	Japan
Harald Buvik	Norway
Leslie Fielding	United Kingdom
Nikolaos Vagiokas	Greece
Boon Hui Chiam	Singapore
Martijn van Gils	Netherlands
Grzegorz Blaszczyk	Poland
Bruce Dandie	UK
Joaquim Olle	Spain
Stefan Jiri	Czech Republic
Kazuhiro Tsuno	Japan
Jan van Boxelaere	Belgium
Christian Gammeter	Switzerland
Rafael Lopez Guarga	Spain
Carlos Mendez Bueno	Mexico
Jens Kristian Tuxen	Denmark
Urs Welte	Switzerland

SP Strategy:

- Draw lessons from current practice regarding safety management, the analysis of road tunnel accidents data and fires worldwide and application of risk analysis.

Expected outputs:

- Best practice on measures to support persons with reduced mobility
- Recommendations on real-time communication with users.

Meetings (average number of attendees is 10):

- Lyon (France) 12th & 13th September 2012
- Barcelona (Spain) 21st & 22nd February 2013
- Videoconference 22nd May 2013
- Videoconference 24th May 2013
- Toensberg (Norway) 12th & 13th September 2013
- Stockholm (Sweden) 28th & 29th November 2013
- Prague (Czech Rep.) 12th & 13th June 2014
- Annecy (France) 18th & 19th September 2014
- Paris (France) 11th & 12th March 2015

1.5. Working Group 4: Fire Safety

Leader:

Les Fielding, United Kingdom

Secretary:

Bruce Dandie, Australia

Active Members:

Radim BAJGER	Czech Republic
Matthew BILSON	Australia
Grzegorz BLASZCZYK	Poland
Rune BRANDT	Sweden / Switzerland
Lionel BROWN	UK
Harald BUVIK	Norway
Ricky CARVEL	UK
Gary CLARK	UK
Bruce DANDIE	Australia
Ignacio DEL REY	Spain
Arnold DIX	Australia
Leslie FIELDING	UK
Sylvain GARNIER	France
Robin HALL	UK
Norris HARVEY	USA
Haukur INGASON	Sweden
Marko JARVINEN	Finland
Roland LEUCKER	Germany
Ulf LUNDSTRÖM	Sweden
Toshiro OTSU	Japan
Xavier PONTICQ	France
Norman RHODES	UK
Marien RIEMENS	Netherlands
Juan Manuel SANZ	Spain
Peter STURM	Austria
Fathi TARADA	UK
Pauli VELHONOJA	Finland
Wah Onn Adrian Cheong	Singapore
Boon Hui Chiam	Singapore
Gary ENGLISH	USA
Jorgen Holst	Denmark
Ryu Ji Hyun	South Korea
Nam-Goo Kim	South Korea
Ronald Mante	Netherlands
Frederic Walet	France
Urs Welte	Switzerland
Franz Zumsteg	Switzerland
Bernhard KOHL	Austria
Dirk SPRAKEL	ITA- COSUF

SP Strategy:

- Draw lessons from current practice regarding safety management, the analysis of road tunnel accidents data and fires worldwide and application of risk analysis.

Expected outputs:

- Best practice for fixed firefighting systems (FFFS) in road tunnels.

Meetings (average number of attendees is 18):

- London (UK) 10th & 11th May 2012
- Kista (Sweden) 23rd & 24th August 2012
- Vienna (Austria) 14th & 15th March 2013
- Madrid (Spain) 16th & 17th September 2013
- Lyon (France) 27th & 28th February 2014
- New York (USA) 26th & 27th August 2014
- Cologne (Germany) 23rd & 24th February 2015

1.6. Working Group 5: Complex Underground Road Networks

Leaders:

Bernard Falconnat	France
Frédéric Walet	France

Secretary:

Bernard Falconnat	France
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Active members:

Martijn Van Gils	(Netherlands)
Bernard FALCONNAT	(France)
Frédéric WALET	(France)
Peter STURM	(Austria)
Michael BACHER	(Austria)
Romano BORCHELLINI	(Italy)
Harald BUVIK	(Norway)
Alexandre DEBS	(Canada / Québec)
Nicolas FURMANEK	(France)
Marko JARVINEN	(Finland)
Tshibela Arthur KABUYA	(Belgium)
Nam-Goo KIM	(South Korea)
Ding HAO	(China)
Ulf LUNDSTRÖM	(Sweden)
Hideto MASHIMO	(Japan)
Eva MONTERO	(Spain)
Antoine MOS	(France)
Eric PREMAT	(France)
Seung-Wan RYU	(South Korea)
Ludvik SAJTAR	(Czech Republic)
Martijn VAN GILS	(Netherlands)
Frédéric WAYMEL	(France)
Jiri ZAPARKA	(Czech Republic)
Alexander Debs	(Canada-Quebec)

SP Strategy:

- Identify and analyse existing and planned complexes of urban underground road networks with interchanges and multimodal concerns from the point of view of operations and safety

Expected outputs:

- Report on case studies and recommendations

Meetings (average members attending is 12):

- Annecy, France June 2012
- Breda, Netherlands October 2012
- Brussels, Belgium February 2013
- Annecy, France June 2013
- Prague, Czech Rep. October 2013
- Toulouse, France February 2014
- Vienna, Austria May 2014
- Lyon, France October 2014
- Stockholm, Sweden February 2015
- Madrid May 2015

1.7. Working Group 6: Knowledge Management

Leader, secretary and webmaster:

Pierre Schmitz, Belgium

Active members:

Willy Delathauwer	(Belgium)
Martijn Van Gils	(Netherlands)
Antonio Valente	(Italy)
Romano Borchellini	(Italy)
Ignacio del Rey	(Spain)
Rafael Lopez Guarga	(Spain)
Olivier Vion	(ITA)
Bruce Dandie	(Australia)
Bernhard Kohl	(Austria)
Kristin van der Auwera	(Belgium)
Ahmed Kashef	(Canada)
Alexandre Debs	(Canada – Quebec)
Laura Väisänen	(Finland)
Marko Jarvinen	(Finland)
Bernard Falconnat	(France)
Jean-Claude Martin	(France)
Marc Tesson	(France)
Seyed Hashemian	(Iran)
Chiara Lucino	(Italy)
Hideto Mashimo	(Japan)
Erik Norstrom	(Norway)
Leonor Silva	(Portugal)
Maria Dourado	(Portugal)
Nam-Goo Kim	(South Korea)
Urs Welte	(Switzerland)
Maria Marton	(Sweden)
Les Fielding	(UK)
Fathi Tarada	(UK)
Nguyen Nguyet Nga	(Vietnam)

Programme:

- Upgrade the web-based version of the Road Tunnels Manual.
- Develop a training course on road tunnel operations and safety for emerging countries.
- Propose new terms and definitions for the PIARC dictionary.

Meetings (average members attending is 5):

- Rome (Italy) 2nd October 2012
- Abu Dhabi (UAE) 14th & 15th September 2014

2. PRODUCTS

2.1. Publications

Papers in Routes/Roads;

- Contribution to RR special Issue 365 on Risk Management: “Application of risk assessment as tool for road tunnel safety management” 2014
- Contribution to RR special Issue 360: Road tunnel safety : HGV driver training in France
- Contribution to RR special Issue 367: The Application of Fixed Fire Fighting Systems in Road Tunnels
- Contribution to RR special Issue 367: Lay-bys and protection against lateral obstacles

Nine new technical reports were drafted by the working groups, discussed and approved by C3.3 and finally submitted for publication:

- Recommendations for sustainable road tunnel operation
- Best practice for life cycle (condition) analysis for tunnel equipment
- Feedback from experience with significant incidents in road tunnels
- Improving safety in road tunnels through real time communication with users
- Road tunnels: Complex Underground Road Networks. Part A case studies
- Monographs on complex underground road networks
- Best practice for fixed fire-fighting systems (FFFS) in road tunnels
- Best practice on measures to support persons with reduced mobility
- Lay-bys and Protection against Lateral Obstacles - Situation In Different Countries.

One technical report, which was mainly drafted during the preceding PIARC cycle (2008-2011), has been published during the cycle 2012-2015:

- Design Fire Characteristics for Road Tunnels

The committee, with the cooperation of the Spanish National Committee has translated into Spanish six reports published during previous cycles

The ‘Road Tunnel Manual’, a online compendium of all of PIARC’s guidance on road tunnel operations. The Road Tunnel Manual is now available in English, French, Spanish, Italian, Czech, Chinese and Arabic. Translations in Japanese, Korean and Portuguese will be available by the time of the World Road Congress.

TC 3.3 has translated 140 terms and definitions to the current 11 languages (Chinese, Czech, English, French, German, Greek, Italian, Japanese, Korean, Slovenian and Spanish), as well as translating the same terms to 9 additional languages (Arabic, Danish, Dutch, Finnish, Norwegian, Persian, Portuguese, Swedish and Vietnamese). In addition the definitions of 47 new terms have been included.

Other publications:

- February 2013 -TES (Tunnels et Espace Souterrain) – magazine of AFTES
- Seattle USA Sept 2015 ISAVFT16 (BHR) Conference

2.2. Seminars

C3.3 organised three seminars in developing or transition countries, which were held after or before a committee meeting:

- International Seminar on “Long tunnels: challenges for design construction and operation” held in Chile on 17-19 October 2012.
- “International seminar on sustainable road tunnel operations”, in Da Nang, Vietnam on 23–25 October 2013.
- Seminar in San Juan, Argentina on “Binational mountainous road tunnels operations” on 15-17 April 2015

2.3 Workshops and training courses

C3.3 and their working groups organised workshops:

- International round table discussion “Feedback from experience on tunnel safety” in Rome, together with the Italian national PIARC committee and the Fastigi foundation
- “Road tunnel operators’ forum” in London, UK on 18 October 2013.

C3.3 participated in the following ITA training courses:

- ITA training course in Riyadh, 25-26 March 2012: 2 lectures on behalf of PIARC on “Specific Aspects of Safety of Road Tunnels”
- ITA training course in Riyadh, 03-04 February 2013: 2 lectures on behalf of PIARC on “Safety In Urban Transport Tunnels”

In addition, a special technical session on Road Tunnel in Winter Conditions, was held during the International PIARC Winter Road Congress in Andorra la Vella (Andorra) in February 2014.

2.4 Other outputs

C3.3 exchanged views and cooperated with the International Tunnelling and Underground Space Association (ITA/AITES), with which it signed a Memorandum of Understanding in 2005. Specifically C3.3 cooperated with their Committee on Operational Safety in Underground Facilities (ITA-COSUF).

C3.3 also cooperated with the European Commission regulatory committee for safety of road tunnels.

C3.3 has also initiated a project for the update of the DG-QRAM software, which was developed jointly by OCDE and PIARC with the objective of the Risk Evaluation of the transport of Dangerous Goods through road tunnels.

At the initiative of a group of Italian experts, and under the aegis of the European Economic and Social Committee, two workshops were held in Brussels at the beginning of February and May 2013, with the participation of the "Road Tunnel Operation" PIARC Technical Committee 3.3. The purpose of these workshops was to examine ways of applying the existing legislation in order to better address the particular points in road tunnels, in light of the Sierre accident and other similar accidents.

2.4 Communications in events

On the committee activities and the Road tunnels Operation Manual

- 2nd European Forum of Road Tunnel Safety Officers in Brussels, 18 January 2012: presentation of the TC 3.3
- 7th China tunnel Summit in Wuxi, 7-8 March 2013: presentation of the TC 3.3 outputs and the Road Tunnel Manual

On the topic of Complex Underground facilities

- Madrid – October 2012 - COSUF meeting
- Brussels – March 2013 - ABTUS Workshop
- Geneva - June 2013 - ITA-COSUF
- Brussels – December 2013 - "Society of Fire Protection Engineers Benelux Chapter"
- January 2014 - Paper concerning the seminar in Da Nang published in TES

Others

- 17th IRF World Meeting in Riyadh, 10-14 November 2013: organization of the PIARC special session on Road Tunnel Safety
- Society of Fire Protection Engineering workshop in Brussels, 20 November 2013: presentation of the PIARC TC 3.3 Activities on Underground Infrastructure
- Arabian Tunnelling Conference in Dubai, 10-11 December 2013: presentation of the Road Tunnel Manual
- Round table discussion: "Feedback from experience on tunnel safety" organised by the Fastigi-foundation and the Italian national PIARC committee; 12 June 2014 at the occasion of the WG2 working group meeting in Rome

**TECHNICAL COMMITTEE 4.1
MANAGEMENT OF ROAD ASSETS**

2012-2015 ACTIVITY REPORT

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1. Committee Members having contributed to the activities

Committee Management

Thomas LINDER	Germany
Gerardo FLINTSCH	United States of America
Philippe LEPERT	France
Ricardo SOLORIO MURILLO	Mexico
Alfred WENINGER-VYCUDIL	Austria
Johannes DIRMEIER	Germany

PIARC

Carlo MARIOTTA	Switzerland
Vicente VILANOVA MARTINEZ-FALERO	Spain
Miguel CASO FLOREZ	Spain
Oscar GUTIERREZ-BOLIVAR	Spain

Working Group 1

John STATTON	Australia
Bart R. MANTE	Netherlands
Steve CRIPPS	Canada
Jaan INGERMAA	Estonia
Hye-Ok LEE	South Korea
Julian LIDIARD	United Kingdom
Ibrahim MAMAN SANDA	Niger
João MORGADO	Portugal
NIK AIRINA BINTI (Ir.) NIK JAAFAR	Malaysia
Albert OKIDJI	Benin
Yuli PAN	China
Ward POELMANS	Belgium
Guy POIRIER	France
KAMAL BIN HAJI AHMAD SAFRY	Malaysia
Even SUND	Norway
Hamid ZARGHAMPOUR	Sweden

Working Group 2

Gerhard EBERL	Austria
Alfred WENINGER-VYCUDIL	Austria
Nafisah ABDUL AZIZ	Malaysia
Sam BEAMISH	United Kingdom
Agnès CALBERG	Belgium
GODJE	Cameroon
Rauna HANGHUWO	Namibia
Mohamed HIMMI	Morocco
Christophe HUG	France
Robert MARSZALEK	Poland
Carlos RUIZ TREVIZÁN	Chile
Konsta SIRVIO	Finland
Miguel VALDÉS FLORES	Chile

Working Group 3

Shigeru SHIMENO	Japan
Renaldo LORIO	South Africa
Eric COQUELLE	France
Rosario CORNEJO ARRIBAS	Spain
Valérie DECOUX	Belgium
Gerardo FLINTSCH	United States of America
Eric GHILAIN	Belgium
Oscar GUTIERREZ-BOLIVAR	Spain
Darko KOKOT	Slovenia
Etienne LEBOUTEILLER	France
Laura PARRA	Spain

Working Group 4

Stephen GAJ	United States of America
Alan TAGGART	United Kingdom
Ben GERICKE	United States of America
HASNUR RABIAIN BIN ISMAIL	Malaysia
Philippe LEPERT	France
Jacky MUKUKA	Namibia
Vittorio NICOLOSI	Italy
José Manuel OSIO MENDEZ	Mexico
Barthe David RANOELINJANAHARY	Madagascar
Florica PADURE	Romania
Omar SMADI	United States of America
Ricardo SOLORIO MURILLO	Mexico

Latin American Regional Group

Carlos RUIZ TREVIZÁN	Chile
José Manuel OSIO MENDEZ	Mexico
Fernando NOVOA	Argentina
Carlos SILVA CRUZ	Nicaragua
Ricardo SOLORIO MURILLO	Mexico
Miguel VALDÉS FLORES	Chile
Roberto VILALTELLA	Argentina
Carlos WAHR	Chile
Vicente VILANOVA MARTÍNEZ-FALERO	Spain
Francisco CRIADO BALLESTEROS	Spain

Other Members

Samuel DUBRUNFAULT	Belgium
Jean-Jacques PEROL	France
Stefan ZIRNGIBL	Germany

2. Issues and Working programs

The Technical Committee 4.1 is part of the Strategic Theme 4 “Infrastructure”. The goal of the Strategic Theme 4 “Infrastructure” and the Technical Committee 4.1 “Management of Road Assets” is the improvement of the quality and efficiency of road infrastructure through the effective management of assets in accordance with user expectations and government requirements while adapting to climate change and changing energy scenarios and policies. While new technological, social and environmental developments are expanding the sphere of interest for road authorities, management of road infrastructure remains their core business. The need for more efficient and effective use of budgets requires constant balancing of funds to road assets in terms of construction and maintenance. Assessing the budget level needed to provide optimal maintenance for road infrastructure and balancing the needs of multiple assets with budgetary constraints is an important part of the work of road administrations. This is reflected in the work of Technical Committee 4.1, which also examine the issue of balancing these important engineering needs with environmental constraints.

The Strategic Plan 2012-2015 included the following issues for the Technical Committee 4.1 “Management of Road Assets”:

- ***Issue 4.1.1 “Assessment of budgetary needs for maintenance of road infrastructure”***
 - Strategies:
 - § Review the approaches and practices taken by countries for assessment of budgetary needs for maintenance of road infrastructure.
 - § Define a common framework allowing comparison, between different countries, of the cost of maintenance of road pavements for given categories of comparable roads.
 - Outputs
 - § Development of case studies.
 - § Illustrate through case studies the best practice for road infrastructure authorities.

- ***Issue 4.1.2 “Optimisation of maintenance strategies for multiple assets of road networks”***
 - Strategies:
 - § Investigate what are the approaches implemented for determining maintenance strategies aiming at making the best use of allocated budgets.
 - § In particular investigate:
 - if and how the strategy is related to the search for an optimum level of expenditure;
 - Approaches used for determining the allocation of maintenance resources under budgetary constraints between the categories of assets (pavements, bridges, tunnels, geotechnical structures, roadside equipment).
 - Outputs
 - Report presenting the methodologies, conditions for implementation of these approaches, lessons learned from the application of these approaches.

- **Issue 4.1.3 “Balancing of environmental and engineering aspects in management of road networks”**
 - Strategies:
From case studies investigate how environmental aspects are taken into consideration in complement of engineering aspects in the management strategies applied to road networks.
 - Outputs
Report on case studies and recommendations.

- **Issue 4.1.4 “Road Assets Management Manual”**
 - Strategies:
Building on the work of the previous cycles, design and start the development of a Road Assets Management Manual, which will integrate the outputs of the current cycle.
 - Outputs
Web-based electronic Road Asset Management Manual

3. Organisation

3.1. Organisation of the TC

The membership of the TC 4.1 includes 57 Members, 20 Corresponding Members and 15 Associate Members (included 4 Young Professionals).

The TC was organized as follows:

Chairman	Thomas Linder, Germany
English Secretary	Gerardo Flintsch, USA
French Secretary	Philippe Lepert, France
Spanish Secretary	Ricardo Solorio Murillo, Mexico
Web Administration	Alfred Weninger-Vycudil, Austria
Personal assistant of the chair	Johannes Dirmeier, Germany
Leader of Working Group 1	John Statton, Australia (2012 – 2013) Bart Mante, Netherlands (2014 – 2015)
Leader of Working Group 2	Gerhard Eberl, Austria
Leader of Working Group 3	Shigeru Shimeno, Japan
Leader of Working Group 4	Stephen Gaj, USA
Leader of Latin American Regional Group	Carlos Ruiz Trevizán, Chile
Contact to Terminology Committee	Mohamed Himmi, Morocco - Leader Alan Taggart, United Kingdom Oscar Gutierrez Bolivar, Spain
Technical Advisor of PIARC	Miguel Caso Florez, Spain

The objectives for the Technical Committee 4.1 for the period 2012 – 2015 were achieved by the work undertaken by four Working groups and one Regional Group.

3.2. Working Groups

3.2.1. Working Group 1:

“Assessment of budgetary needs for maintenance of road infrastructure”

The aim for Working Group 1 was to review the approaches and practices taken by countries for assessment of budgetary needs for maintenance of road infrastructure. This was elaborated by a questionnaire and case studies. A common framework should be defined allowing comparison, between different countries, of the cost of maintenance of road pavements for given categories of comparable roads. The best practices for road infrastructure authorities should be illustrated through case studies.

a) Methodology

As part of the work of the committee, together with Working Group 2, an extensive questionnaire was developed. Using interviews, the questionnaire was discussed with representatives of over 30 road authorities (either public or private sector, distributed over developed countries and countries in development).

b) Background – budget definition

Good road infrastructure is fundamental to building a strong economy and welfare. It is a substantial factor that significantly affects the rate of economic growth. Proper maintenance planning and execution is therefore very important. As the ability to conduct proper maintenance is largely influenced by the available budgets, budget definition is an important starting point in realizing the overall goal.

Development of infrastructure networks takes time. Due to this time aspect, a network will consist of assets of different age classes, related conditions, and associated risks. Having a consistent long-term plan helps in making the right decisions when defining and prioritizing the maintenance business case. The long-term plan should encompass goals, tactics, and indicators that illustrate whether the goals are met (dashboard). It should focus not only on maintenance but also on the relation between infrastructure development and changes and innovations in society (e.g., electrical cars, automated vehicles, shifts in modal split). The involvement of wider industry is important to be able to identify such changes.

c) Fundamentals in budget definition

Several aspects have to be considered when developing the budget:

- Asset collection
A good data set is vital to the budget definition. Without a reliable data set it is not possible to perform analyses on the use and degradation of the assets and the need for maintenance, including its costs. Furthermore, without such a data set it is not possible to relate the current asset collection to network performance and risks and develop a maintenance strategy.
- Strategic targets and requirements
The necessary budget is directly related to the required performance and acceptable risk levels for the road authority. Differences between requested and delivered performance define the need for maintenance or enhancement of the asset collection.

- **Planning horizon and options**
When budgeting, one has to take into account the fact that future income and expenditures are less certain. The reason is that many aspects can change during time. For example, the maintenance plan has to be detailed enough that both technical as well as stakeholder wishes are implemented. Therefore, many administrations work with planning horizons that have an effect on the amount of work done to define the “numbers” in the budget.
- **Expenditure and funding categories**
In budget execution, most authorities discern capital expenses (CAPEX) and operational expenses (OPEX). Although for the total costs of maintenance it is not directly relevant whether costs are labelled CAPEX or OPEX—the total sum of money involved does not change—it is important to understand the concept of labelling. Especially when benchmarking between authorities, the way costs are labelled can influence results of the comparisons.
- **Organizational ability to deliver maintenance program**
One never delivers a maintenance program completely on its own. All kinds of stakeholders are involved. As most work is contracted to external companies, the way industry develops and changes (becomes more efficient) is an important factor in achieving the set goals. The involvement of industry results in early information on future infrastructural system development and the ability to decide what current actions contribute to this development. To get “value for money,” industry has to be challenged to develop itself: becoming more competitive, more cost effective, and introducing new concepts and innovations in delivering their products. This helps authorities by making it possible to maintain the ever increasing amount and complexity of the network without the need to continuously increase maintenance budgets.

d) Definition and delivery of business case

Within any organization, whether public sector (government) or private sector (company), there is competition for the available budget. Therefore, it is important to show what value for the money will be derived from any budget provided. Use of a “business case” supports this. Such a case includes:

- purpose or long-term goal;
- assumptions and methods;
- actions and projected results;
- sensitivity and risk analysis;
- recommendations.

Several options to be chosen from should be provided, and the suggested option should be highlighted. Commonly, the suggested approach will be related to providing the most value for money. Next to this optimal scenario, also scenarios such “do minimum” and “do something” should be discerned.

The business case should relate to the interests of the decision-makers. These are organization specific. It should include a future vision to provide a waypoint to be able to relate short-term actions to long-term goals. From the interviews, it was concluded that many road authorities have to work inside a certain number of constraints, such as:

- current asset condition and target asset condition;
- description of the type of maintenance;
- target in terms of level of service (LOS) and forecasted levels of service;
- necessary budget and alternatives;
- consequences of not funding;

- risks as effect on user and stakeholder;
- ability to deliver the business case.

These constraints limit the number of possible scenarios and shifts in budgets.

It was shown that it is helpful to have external auditing on both the business case as well as the results of the maintenance program. When delivering the business case, focus should be on short-term actions and medium-term goals, without losing the long-term objective. It is important to try to find a positive note and be consistent with the information provided in the last presentations. Common elements that have been successful in influencing decision-makers are:

- emphasizing the effect on safety levels of the network and objects;
- emphasizing the effect on environmental benefits of specific works/projects;
- impact on road condition from the road users point of view;
- impact on legal and political downfall related to specific works/projects;
- resulting backlog and financial effects related to backlog;
- effects of the changing environment (new methods, more traffic, increasing demands of stakeholders, etc.) in which the works have to be executed.

e) Benchmarking across road authorities

The interviews indicated that road authorities experience a growing pressure to optimize the maintenance and operation of road networks. The road industry is not known to be the most innovative and cost-efficient sector. Commonly, a way to find areas for improvement is by benchmarking one organization to another. From experience, it was concluded that consistent benchmarking with meaningful conclusions is very difficult. Many factors affect the results. Therefore, results always have to be interpreted and placed in the context of the benchmarking study itself.

In Europe, an extensive effort was made to compare/benchmark the maintenance costs of several road authorities. From this study it was learned that in order to be relevant benchmarking has to:

- take into account the distinctive profile of each operated network;
- cover the real-world experience implemented at the operational level;
- guarantee the homogeneity and exhaustiveness of scopes for external and internal costs related to maintenance and operation;
- consider that accounting rules and practices can differ significantly from one network to another.

Even with the extensive effort in the study, it was concluded that clear conclusions on cost levels and cost effectiveness were not possible. At best, indicators could be provided that the different road authorities could use to improve themselves.

3.2.2. Working Group 2: “Optimisation of maintenance strategies for multiple assets of road networks”

The aim for Working Group 2 was to investigate maintenance strategies aimed at making the best use of allocated budgets. In particular, Working Group 2 was to investigate if and how strategy is related to the search for an optimum level of expenditure. Additionally, the approaches used for determining the allocation of maintenance resources under budgetary constraints between the categories of assets like pavements, bridges, tunnels, geotechnical structures, and roadside equipment were to be investigated.

a) Methodology

As part of the work of the committee, together with Working Group 1, an extensive questionnaire was developed. Using interviews, the questionnaire was discussed with representatives of over 30 road authorities (either public or private sector, distributed over developed countries and countries in development).

The answers of the interviews were analysed and provide the basis for the follow-up discussions and the final recommendations for the determination of maintenance strategies and cross-asset management, and for the allocation of the budget available over different assets.

b) Basis for maintenance strategies and optimum budget allocation

Holistic asset management has become a standard in many countries around the globe. The periodic collection of data in the form of measurements and visual inspections of pavements and bridges is state of the art in developed countries and in countries with developing economies, and is the basis for extensions into other assets. Especially for concessions, the extent of data collection and monitoring covers most of the assets to be taken into account by asset management (depending on the definition and the type of the contract).

Almost every road administration (public and private) stores the collected information in databases. Furthermore, many road administrations are using (sophisticated) asset management tools (Pavement Management System, Bridge Management System, etc.) to support the decision processes in finding the best maintenance treatment strategies for a specific asset.

c) Asset management processes

Most of the processes are technical and driven by asset-specific analysis. Cross-asset management will be carried out by using engineering judgment and assessment procedures. Almost no road administration runs an optimization of maintenance treatments over different assets, taking into account strategic targets and objectives for the whole network. Although these strategic targets are defined in the form of strategic papers, a clear and repeatable connection to technical indicators (of asset elements or properties) is missing to a wide extent.

The interviews showed that missing data, organizational structures, the complexity of the problem and the compatibility of asset-specific indicators are the main barriers for cross-asset management optimization. Thus, the combination of maintenance needs of different assets by using unified indicators, which are in adjustment with the strategic targets and objectives (policy), is not state of the art in asset management in the majority of road administrations at the moment.

d) Cross-asset management is a step into the future

The optimization of maintenance strategies requires a holistic process, beginning from a comprehensive data management, over a unified assessment of all assets in accordance with the strategic targets and requirements, till an organisational structure, which enables an easy merging of the maintenance needs of different assets. To manage this process the strategic targets have to be translated into technical indicators.

The discussion during the interviews showed that many road administrations are planning or implementing a holistic asset management framework. Maintenance needs, which are derived from asset-specific analysis, will be not the final result anymore. But, maintenance needs will be an input for a strategic assessment process, including different aspects of the whole asset management framework (technical, environmental, social, sustainability, availability, etc.). The benefits of such an approach can be summarized as follows:

- Improvement of the availability of the road network by improved coordination of asset-specific maintenance treatments;
- Increase in traffic safety by reducing the number of maintenance sites;
- Reduction of maintenance risk from a network point of view (not only from a technical, asset-specific point of view);
- Reduction of maintenance costs and the number of maintenance sites, as well as an increase of maintenance productivity (parallel maintenance treatments on different assets within the same site);
- Reduction of negative impacts to neighbours and the environment by reduction of the number of maintenance sites and the total duration of traffic disturbances during the whole life cycle of a road section;
- Easy integration of external factors into the decision process (corridors, seasonal influences, events, etc.);
- Avoidance of extensive network constraints caused by maintenance treatment on parallel roads or on detours at the same time;
- Conclusions about the achievement of the strategic targets and objectives;
- Improvement of communication within the road administration (at the technical level but also from the technical to the strategic level).
- Better marketing of road infrastructure asset management to policy makers and the public

Of course, most of the benefits can be achieved by asset-specific assessment procedures without network-level optimisation. But cross-asset management derives a benefit from a more holistic point of view, where asset-specific maintenance needs are an integrated part of an asset management process, which is oriented to different stakeholder needs and expectations.

3.2.3. Working Group 3: “Balancing of environmental and engineering aspects in management of road networks”

The aim for Working Group 3 was to investigate from case studies how environmental aspects are being incorporated into decision-making to complement the engineering and economic aspects concerning the management of road networks.

a) Methodology

After a literature review, a questionnaire with 13 questions was developed. A total of 18 agencies (15 countries) responded to the questionnaire through personal interviews with engineers of the surveyed road agencies. Interviews were chosen as the method to provide a chance to define and explain the meaning of each question clearly and to make sure reliable answers were received. The responding agencies represented urban and rural regions as well as different economic levels (developing and developed).

b) Analysis and results of the survey

There are large environment-related regulatory systems in some developed countries that have legislation and guidelines requiring the implementation of techniques for environmental preservation, such as the avoidance or mitigation of impacts, or recycling methods. Conversely, many developing countries have not yet developed comprehensive regulatory systems.

Although environmental impacts are seriously recognized in many countries, they are not necessarily given high priority, even in developed countries while road safety is one of crucial factors for the priority. Results from the survey indicate that limited agencies have targets or programs on climate change for maintenance projects.

Regarding environmental concerns, reuse of waste, polluted soils landfill evacuation, noise, water permeability, and CO₂ emissions are often recognized in urban areas, while the drainage of rainwater, surface run-off water, and wild animal passage are important in rural areas.

Noise is the most frequently addressed environmental concern, and many agencies also set up the targets for recycling under the control of related regulations and guidelines.

Regardless of economic development level, almost all agencies operate pavement management systems, and some agencies also operate bridge management systems. Traditionally, many agencies use the life-cycle costs (LCC) analysis and a multi-criterion analysis to select projects.

In general, the mitigation of projects due to environmental reasons is of low probability or not likely in many countries. In several countries, the environmental legislation affects the priority of projects and the budget allocation to such projects.

Pavement recycling and heat-insulating pavement, etc. are described as good practices to take into account environmental aspects. A rating tool by life-cycle activities called "Greenroads" was also mentioned for evaluating the environmental impact of construction projects and selecting environment-friendly materials and methods.

c) Conclusion

Environmental impacts are seriously recognized in many countries but are not necessarily given priority, even in developed countries, while many agencies operate management systems, and the LCC analysis and a multi-criterion analysis are traditionally used to select projects.

There are many environmental concerns, like reuse of waste, polluted soils, noise, CO₂ emissions, surface run-off water and wild animal passage, etc. environmental countermeasures increase costs and sometimes result in the delay of projects.

3.2.4. Working Group 4: "Road Assets Management Manual"

The aim for Working Group 4 was to design and develop a Road Asset Management Manual to meet the needs of developing and developed countries (road authorities). The manual will be online (Web based) and continue to be updated with time. The manual aims to advance the state of the practice of managing road assets.

The Road Asset Management Manual has been developed based on an asset management framework based on leading practices from around the world with examples and case studies representing basic, proficient, and advanced levels. The Manual has been developed with the following sections:

- Introduction Asset Management Maturity Levels
- Organization of the Agency
- Inventory and Condition
- Performance Indicators
- Performance Gaps
- Life Cycle Cost Analysis
- Risk
- Financial Plan
- Asset Valuation
- Asset Management Plan
- Works Programming/Resource Allocation
- Investment strategies
- Performance Monitoring
- Management systems
- Communications

For each section, basic, proficient, and advanced levels of asset management are addressed.

The Asset Management Manual has been developed to be a Web-based manual with the framework and tags similar to other PIARC Manuals. The manual was reviewed by Technical Committee 4.1 in the spring of 2015, with most comments and edits being addressed. A draft final Manual formatted and tagged for Web review will be available in late summer 2015 for external review. The Manual may be available at the 2015 Seoul World Road Congress.

3.3. Regional group

In accordance with that established in the Blue Guide regarding Technical Committees (TC), the 2012-2015 cycle was chosen to promote and transfer in-depth technical knowledge of various regional matters to selected Technical Committees, including TC 4.1. The Latin-American Working Group (LAWG) was then created, and started working simultaneously with its associated Committee.

Although members of this LAWG are listed in section 1 of this report, it should be noted that, for much of the current work cycle, the group was composed of nine (9) active members: the two representatives of Argentina (Mr. Novoa and Mr. Vilaltella), the two representatives of Mexico (Mr. Solorio and Mr. Osio), the two representatives of Spain (Mr. Vilanova and Mr. Criado), the representative of Nicaragua (Mr. Silva) and the two representatives of Chile (Mr. Ruiz and Mr. Valdes).

As indicated in the following table, a total of seven (7) LAWG meetings were held during the 2012-2015 cycle.

MEETINGS OF LAWG OF TC 4.1 CYCLE 2012-2015

ORDER	PLACE	DATE	ATTENDEES Nº	COUNTRIES ATTENDEES
1 ST	Santiago, Chile	May 15-17, 2012	7	Argentina, Chile and Mexico
2 nd	Queretaro, Mexico	December 5-7, 2012	7	Argentina, Chile, Mexico and Nicaragua
3 rd	Buenos Aires, Argentina	May 15-17, 2013	6	Argentina, Chile, Mexico and Nicaragua
4 th	Puerto Natales, Chile	October 23-25, 2013	5	Argentina, Chile and Mexico
5 th	Cancun, Mexico	April 2-3, 2014	6	Chile, Mexico and Spain
6 th	Madrid, Spain	November 26-28, 2014	8	Argentina, Chile, Mexico and Spain
7 th	Monterrey, Mexico or Barcelona, Spain	June or July, 2015	?	??

In addition to the above meetings, some LAWG members participated in all meetings of the Technical Committee to inform about the progress of the regional group and to make sure the group contribution is integrated within the work of the Technical Committee.

The main activities performed in this cycle by the LAWG are listed below:

- Participation in the TC 4.1 and REAAA (Road Engineering Association of Asia and Australasia) joint workshop held in Kuala Lumpur, Malaysia on March 27, 2013, with the presentation "Road Asset Management in the Member Countries of the Latin American Group of PIARC Technical Committee 4.1".
- Organization of the "PIARC International Seminar on Road Infrastructure Management: Current Practice and Development Prospective", which was held in Cancun, Mexico, from March 31 to April 2, 2014. This seminar had over 200 attendees from more than 30 countries around the world. The 2014 3rd Quarter edition of the Routes/Roads magazine featured an article about this Seminar.
- Organization of the 5th Meeting of the TC 4.1, which took place on April 3 and 4, 2014 in Cancun, Mexico.
- Preparation and delivery of an article for the thematic edition of the Routes / Roads magazine on Asset Management. The article deals with the Latin American current practice of Road Asset Management. Thematic Edition in production.

- Development of a final report concerning the reviewing of the current status of Road Asset Management in Latin America and the formulation of recommendations for further advancing this subject in the region. The report, which is intended to serve as a reference guide for professionals in this field, is entitled “Road Asset Management: An Hispanic-American Vision”, and has the following table of contents:

Chapter I: Introduction
 Chapter II: General Description of Latin-American Roads
 Chapter III: Information for Road Asset Management
 Chapter IV: Programming and Budget Allocation
 Chapter V: Road Asset Management Systems in Latin America
 Chapter VI: Recommendations for the Management of Road Assets in Latin-American Countries

Finally, the members of LAWG expect to have an active participation in the PIARC World Congress to be held in Seoul, South Korea in late 2015. Also, members hope the activities performed during this cycle, together with the successful completion of their final report will serve as an example of the contribution that regional groups can make to PIARC activities so that their permanence is considered for future cycles.

3.4. Meetings

The Technical Committee held two face-to-face meetings a year. The first meeting of the Technical Committee after the World Road Congress was held at the Central Office of PIARC in Paris.

March 2012	Paris, France	32 participants
September 2012	Norfolk, United States of America	26 participants
March 2013	Kuala Lumpur, Malaysia	28 participants
October 2013	Liège, Belgium	33 participants
April 2014	Cancún, Mexico	26 participants
September 2014	Vienna, Austria	26 participants
April 2015	Rome, Italy	?? participants
November 2015	Seoul, South Korea	

4. Reports and Publications

- Technical Report “Assessment of budgetary needs and Optimisation of maintenance strategies for multiple assets of road network”, 2015
- Technical Report “Balancing of environmental and engineering aspects in management of road networks”, 2015
- Road Asset Management Manual, 2015
- Routes/Roads: Special issue “Road Asset Management”, n° 366, 2015

5. International Seminars

- **14th REAA conference**
Workshop “Management of Road Assets”
at 14th REAA conference
26 to 28 March 2013, Kuala Lumpur, Malaysia

- **PIARC International Seminar on Road Infrastructure Management**
“Current Practice and Development Prospective”
31 March to 2 April 2014, Cancún, Mexico

During the seminar road professionals from the 31 states of Mexico and from 19 countries around the world met in Cancun to participate in this PIARC International Seminar on Road Infrastructure Management: Current Practice and Development Prospective.

As Thomas Linder, chair of PIARC TC 4.1, pointed out at the beginning of this event, it has been the first seminar of its class held in Latin America that has been devoted entirely to Road Infrastructure Management, an area of knowledge that has become increasingly relevant given the challenge of ensuring the comfort, reliability, accessibility and safety of the road system in a context marked by restrictive budgets, high expectations of the stakeholders and a strong evidence of climate change.

A total of 16 presentations were made in this seminar, 6 by members of PIARC technical committee 4.1 and the other by speakers from Latin-American countries. The speakers represented Argentina, Austria, Chile, Germany, Mexico, Poland, Spain, Sweden and the United Kingdom as well as the Inter-American Development Bank.

During the event, various topics of road asset management were dealt with, including conceptual issues, level of service definition and measurement, resource allocation among asset classes, management of contracts granted to private operators and good practice related to the implementation of asset management by regional or private bodies. Presentations were supplemented by valuable participations from the audience, in which both conceptual aspects and specific practical concerns were addressed.

In terms of figures, the seminar can be summarised as follows:

- Number of participants: 256, including delegates from Austria, Argentina, Chile, Colombia, France, Germany, Japan, Malaysia, Namibia, Nicaragua, Norway, Peru, Poland, Portugal, Spain, Sweden, United Kingdom and the United States. Approximately 30 delegates came from countries other than Mexico.
- 16 speakers and 4 session chairs whose participation accounted for the scientific foundation of the seminar.
- 20 sponsors, including 6 exhibitors. Contribution of these was essential for ensuring the economic viability of the seminar.

The above facts and figures confirm that this seminar has been a successful event, which undoubtedly will contribute to open new opportunities for the development of road infrastructure management in Mexico and in the Latin-American region.

Last but not least a big thank you has to be given to the Mexican organizers of the seminar for the excellent preparation and for sure to all session chairs, speakers and participants in the discussion as well as to the exhibitors and all other contributors in the fore- and background. The high appreciation of the seminar through the participants is expressed in the seminar evaluation where all the aspects have been rated with an average result between 4 and 5 in terms of a rating scale from 1 to 5 with 5 being the highest rating.

6. Congresses

6.1. World Road Congress Seoul 2015

The four years working cycle between the World Road Congresses will be concluded with a half a day Technical Committee Session during the World Road Congress in Seoul in November 2015.

The first part of this session will show the results of the work of Technical Committee 4.1 "Management of Road Assets". Namely the outputs will be presented which are two reports concerning the committee issues and the Asset Management Manual that has been developed during the working cycle. The web-based manual as a powerful tool for asset management beginners as well as experts will be explained and demonstrated online for the first time.

The second part of the Technical Committee Session is dedicated to the presentation of papers that have been submitted according to the call for papers and to a discussion of asset management matters between speakers, the audience and Technical Committee members.

6.2. Other Congresses

- **EPAM 2012**
Presentation "The World Road Association and Management of Road Assets"
by TC-Chair Dr.-Ing. Thomas Linder
at EPAM 2012
5 to 7 September 2012, Malmö, Sweden

- **XXVIII International Baltic Road conference**
Presentation "Management of road assets – past and present work done by the World Road Association (PIARC)"
by TC-member Even Sund (on behalf of TC-Chair Dr.-Ing. Thomas Linder)
XXVIII International Baltic Road conference
26 to 28 August 2013, Vilnius, Lithuania

- **16th Annual Surveyor Conference & Exhibition**
Presentation "Strategic Road Asset Management"
by TC-Chair Dr.-Ing. Thomas Linder
at 16th Annual Surveyor Conference & Exhibition
30 May 2014, Nottingham, United Kingdom

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**TECHNICAL COMMITTEE 4.2
ROAD PAVEMENTS**

2012-2015 ACTIVITY REPORT

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1. INTRODUCTION

1.1. Aim

Road pavement technologies have various dimensions according to experiences of and circumstances faced by countries. Understanding the similarities and the differences could be a significant foot step for improving the pavement technologies and bridging the gap between developed countries and developing countries. This has been endeavored by TC 4.2 through the sharing of information and discussion on issues.

1.2. Membership

Number of members : 117 (including associate and corresponding members)

Number of countries : 55

Chair : Seung-Hwan HAN (Co-chair : Benoit Petitclerc)

Secretaries : Ferdinand Van Staden(EN), Benoit Petitclerc(FR), Jose del Cerro(ES)

TC Webmaster : Mats Wendel

Liaison for Terminology Committee : Michael Moffat

2. WORKING THEMES

The first step for coming up with relevant strategies for pavement maintenance is to get reliable data on pavement conditions. Progress and innovations for procurement of high quality data have been reviewed considering their implementation as a first working theme. On the other hand, when determining the timing of resurfacing, the methodology for decision making needs to be known. Through the questionnaire, the methodology has been surveyed.

Secondly there is a great concern on the recycling technologies in the field of pavement engineering. It has been more than 10 years since the old guideline for reuse & recycling was first laid out in the previous cycle. Accordingly, it is important and necessary to upgrade and update the older version considering the technological advancements thus far and changes in circumstances.

Table 1. Working themes of TC 4.2

Category	Working theme	Leader
Theme 1	Road condition monitoring Expected service life of wearing courses	Michael Moffatt (Jean-Etienne Urbain)
Theme 2	Guideline of reuse and recycling of pavement materials	Mats Wendel (Benoit Verhaeghe)
Theme 3	Life cycle carbon footprint of pavement construction	Mike Southern (Anne Beeldens) (José Del Cerro)

In view point of sustainability, the estimation of carbon footprint for the road construction is an indispensable item considered. This working theme could be the topic continued for a while as well as recycling technologies.

Three working themes were planned in this cycle and conducted by members. For each working theme, a working group was organized after the launch of TC and has been lead by a working group leader indicated in the table below.

2.1. Working Group 1

WG-1 reviewed progress in road condition monitoring and road/vehicle interaction technologies. Especially new technologies such as high speed FWD were examined. Several other technologies for quality control of monitoring data were also investigated. Furthermore different approaches in accessing the service life of wearing courses were surveyed through the questionnaire. Efforts were made to understand why and when they replace the surface courses and what factors affect the relevant decision.

2.2. Working Group 2

WG-2 undertook the work for updates and upgrades for the guidelines on the reuse and recycling of pavement materials. It has been several years since the guideline has been developed. It is therefore important to reflect the knowledge and experiences gained in recent years. These include 'in-place recycling with cement', 'in-place recycling with emulsion/foamed bitumen', 'hot mix asphalt recycling in plant', 'recycling & reuse of asphalt mixes' and 'recycling & reuse of concrete pavements'. The guidelines will be posted on the website in an electronic version for widespread uses.

2.3. Working Group 3

WG-3 investigated and compared the models of estimating carbon footprints in pavement construction processes and how to reduce it. Through this invaluable review, the limitations and possible applications were understood. Responses to the questionnaire from several countries were analyzed. Recent innovations for reducing carbon footprint were reviewed. They cover warm mix asphalt technologies, advantage of dry stockpiles, and use of recycled materials.

Table 2. Scope and output of working themes

Strategy	Outputs
4.2.1: Road condition monitoring and road/vehicle interaction	
<ul style="list-style-type: none"> · Review the progress in road condition monitoring and road/vehicle interaction technologies, including Intelligent Transport Systems. · Identify and review the different approaches taken by institutions and industries in assessing and determining the service life of wearing courses. 	<p>Symposium SURF2012 and state of the art report on road condition monitoring and road/vehicle interaction.</p> <p>State of practice report and recommendations to form part(s) of the Association's Knowledge-Base.</p>
4.2.2 : Recycling and reuse of pavement materials	

<ul style="list-style-type: none"> Building on the guidelines produced by past TC on in-place and in-plant recycling, up-date, up-grade and complement (in the area of concrete pavements in particular) the guidelines taking into consideration the knowledge and experience gained during the recent years and the progress in technology. Attention should be paid to recommendations for countries where recycling is not yet widespread. 	<p>Electronic version of the up-graded guide lines to form part(s) of the Association's Knowledge-Base.</p>
<p>4.2.3 : Reduction the life cycle carbon footprint of pavement construction</p>	
<ul style="list-style-type: none"> Review field feedback on recent innovations (products, equipment) which contribute to reduce the carbon footprint in pavement construction. This will include in particular warm asphalt concrete technologies. Critical review of the assessment of reductions in the carbon footprint as compared to standard methods of construction including the use of reused, recycled and recovered materials. 	<p>Report on assessment of recent innovations to form part(s) of the Association's Knowledge-Base.</p> <p>Report on the assessment of performance of carbon footprint reduction to form part(s) of the Association's Knowledge-Base.</p>

3. TC MEETINGS

3.1. Overall Schedule of TC meetings

Two meetings a year were held for the TC activities in accordance with the Blue Guide of PIARC. The following table shows the summary of TC 4.2 meetings held in this cycle. From the kick-off meeting in Paris, two meetings a year were planned in TC. There was an effort made to schedule one meeting in Europe and the other in another region given the large number of members from European countries.

Table 3. Venue and date of TC 4.2 meetings

Year	Venue	Date	Related events
2012 1 st semester	Paris France	13 th ~15 th Mar. 2012	Kick-off meeting
2012 2 nd semester	Norfolk USA	16 th ~18 st Sep. 2012	SURF conference
2013 1 st semester	Kuala Lumpur, Malaysia	24 th ~25 th Mar. 2013	REAAA conference
2013 2 nd semester	Liege Belgium	9 th ~10 th Sep. 2013	Belgian Road Congress
2014 1 st semester	Beijing China	24 th ~25 th Mar. 2014	Joint seminar
2014 2 nd semester	Quito Ecuador	13 th ~14 th Nov. 2014	Joint seminar
2015 1 st semester	Cologne Germany	16 th ~18 th Mar. 2015	
2015 2 nd semester	Seoul Korea	2 nd ~5 th Nov. 2015	World Road Congress

3.2. TC meetings in 2012

There was a kick-off meeting in Paris to begin this cycle in March. The second meeting was held in Norfolk, U.S. in September. When it started TC activities, SURF Conference (7th Symposium on Pavement Surface Characteristics, SURF2012) was already set up in the former cycle. Thus, we could have an autumn meeting in Norfolk, US with the help of the U.S. National committee, FHWA (Federal Highway Administration of US) and the organizing committee of SURF conference. The nomination of working group leaders and members was the first thing to do - to ensure volunteering, balanced arrangement and active participation, thereby guaranteeing better outcomes for all the themes. In the kick-off and Norfolk meetings, much time was spent to clarify what and how to do in this cycle concerning the themes assigned at the council meeting in Mexico World Road Congress.



Figure 1. Group Photo of TC members in Paris meeting

3.3. TC meetings in 2013

The meetings of 2013 were held in Kuala Lumpur, Malaysia in March and in Liege, Belgium in September respectively. Hosting a meeting as a concurrent event of a conference is beneficial in many ways. Those meetings were held during or in beginning of the 14th REAAA (Road Engineering Association of Asia and Australasia) Conference and 22th Belgian Road Congress. The cooperation between TC and REAAA TC-2 "Pavements" (chaired by Mr. Yasumasa Torii) was suggested and discussed. They accepted the suggestion and harmonized their working themes with ours. It was expected to append the output from the REAAA to or have an event like a joint workshop in the next Congress for discussing the results of the same working theme. The recycling of pavement materials was determined as a common theme. And there was a session for introducing the activities of PIARC TC4.2 to REAAA members. The Liege meeting was focused on making a progress in working themes. The meeting was held just before the Belgian Road Congress. Thus, some members also participated in the congress. In these meetings, the work for the themes was broken down and assigned to all members. And then the work done by members was reviewed and discussed in TC meetings.

3.4. TC meetings in 2014

There were two TC meetings together with joint international seminars in Beijing, China and in Quito, Ecuador in 2014. These activities are exactly in accord with 'exchanging the knowledge of road engineering', one of the main goals of PIARC. Thus, it was a good chance to have a meeting with quite a few members from China and Ecuador in these occasions. Some technical issues related to the working themes were discussed with Chinese engineers and other members in the Beijing meeting. On the other hand, in Quito meeting, there were many members from the Latin America Working Group covering Ecuador, Chile, Mexico, Argentina, Colombia and Brazil.



Figure 2. Group Photo of TC members in Kuala Lumpur meeting



Figure 3. Group Photo of TC members in Liege meeting



Figure 4. Group Photo of TC members in Beijing meeting

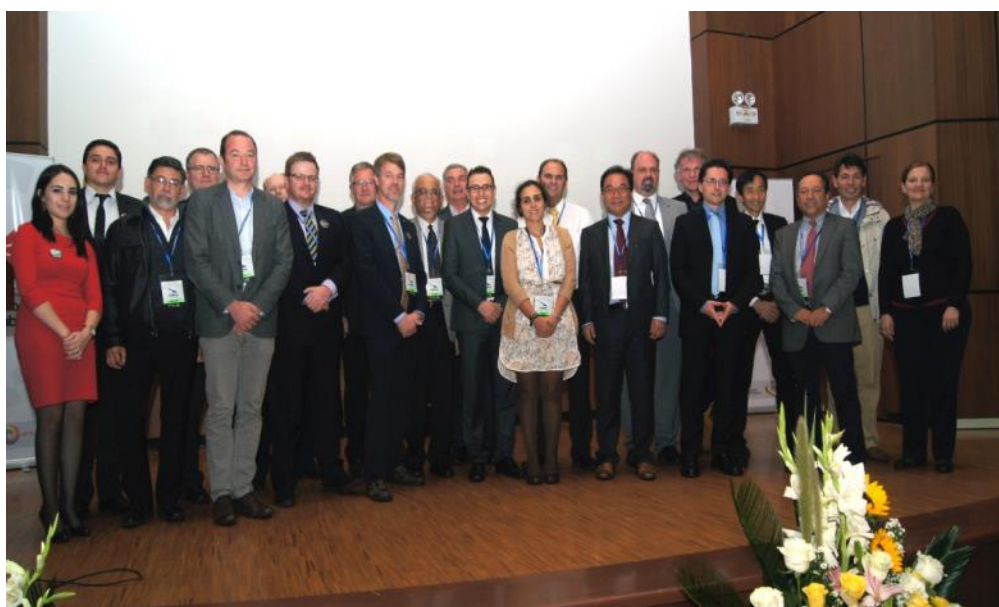


Figure 5. Group Photo of TC members in Quito meeting

3.5. TC meetings in 2015

The first TC meeting of 2015 was held in Cologne, Germany in March. As it was the last meeting leading up to the Congress, there were several things that should have been done in this meeting - such as reviewing of papers, finalizing the contents of TC report, setting up the schedule of reviewing and translating the reports, preparing the Congress. Generally, two days are assigned for meeting while one day is given for technical tour. In this meeting, however, two and a half days of meeting and a half day of technical tour were planned.

With respect to paper reviewing, more than 90 abstracts and 63 full papers were submitted. As three reviewers are needed for each paper, it is not easy to assign reviewers and keep the due time considering the large number of papers. Members were asked to participate in the meeting and check the procedures. The session and workshop programs were formulated in this meeting through the discussion among members. The discussion covers topics, presenters, desirable formats and time schedule arrangement. The time table for

reviewing and translating TC reports and guidelines were also checked in this meeting. Meanwhile, in the parallel meetings of working groups, detailed contents of outcome were examined thoroughly.



Figure 6. Group Photo of TC members in Cologne meeting

4. JOINT INTERNATIONAL SEMINARS

4.1. Joint International Seminar in Beijing

TC 4.2 had a joint international seminar on “road condition monitoring and material recycling technologies for pavement construction” with Chinese Ministry of Transportation in 26-28 March 2014 in Beijing. It followed the first semester TC meeting in 24-25 March. This was a good opportunity to consolidate the basis for road technology exchanges.

Although TC has some Chinese members, their participation had not been usual enough to have a chance of sharing information and understanding the circumstances of road engineering in China. Thankfully, Ministry of Transportation in China (Research Institute of Highways) hosted the joint international seminar which had 2-day sessions and 1-day technical tour. The theme of “road condition monitoring” included some sub-topics such as (1) Quality control of data collection and analysis (2) Analysis of the condition data (3) State-of-the-art of road data collection techniques and their implementation. And (1) Cold recycling technology of asphalt pavement (2) Hot recycling technology of asphalt pavement (3) Recycling technology of cement concrete pavement were the sub-topics of the second theme “material recycling technologies for pavement construction”.

In this international seminar, 23 papers from TC members and Chinese road engineers were presented to the Chinese audience. As widely known, with rapid development of the highway networks in China, they have become more interested in the road technologies that can ensure efficiency and economy. Chinese engineers presented 14 papers as regards these developments. Nine papers were given by TC 4.2 members as well. The participants of the seminar include 24 of TC members and 275 Chinese engineers - who were field and public engineers from 24 provinces of China.



Figure 7. Photos of opening session in Beijing Seminar



Figure 8. Photos of presentation and discussion in Beijing Seminar

Various technologies for the implementation of road condition monitoring were introduced on the first day of the seminar. Road engineers around the world were striving to put in place PMS (Pavement Management System) or improve its performance in local governments as well. Especially, it was noticeable that combining the image data with the condition data was successfully implemented for practical uses in some areas. Quality control of road condition monitoring data was also a hot topic in the seminar. Several technologies were presented to make the data available at the project and the network level.

Presentations on re-use and recycling of pavement materials were given on the second day of the seminar. The overall status of recycling in some countries and specific technologies were examined by several researchers. Mix design, construction process for field implementation and evaluation of performance were covered in the papers presented. The guidelines of PIARC and US that are standardized for quality control were also introduced to Chinese road engineers.

We can have some conclusions that: road condition monitoring requires not only traditional pavement engineering technologies but also sort of converging technologies like image interpretation, GIS, meteorological information and so on. Some of those



Figure 9. Proceedings

technologies are still on the stage of development while others are already being utilized around world. As to the issue of reuse and recycling, almost all the countries are striving to come up with technologies to guarantee the quality of materials. In this stage, we expect that the work of guideline upgrading currently undergoing under the PIARC TC working theme would be quite helpful.

The participants were so enthusiastic about listening to the presentations from PIARC TC members and Chinese road engineers. Despite differences in engineering circumstances, information sharing is still useful. Participants commented that this kind of seminar for exchanging ideas would be more effective than any other form of TC activities for attaining the goal of PIARC.

4.2. Joint International Seminar in Quito

The international seminar of TC 4.2 "Road Pavements" with Latin American Working Group was held in Quito, Ecuador in 10-12 November 2014. It was hosted and well arranged by the Ecuadorian Ministry of Transport and the National Committee in partnership with Latin American Working Group of TC 4.2. Almost 400 people participated in the seminar from neighboring countries including Ecuador. A few engineers and Latin American members of TC came from Mexico, Chile, Colombia, Peru, Argentina, Brazil and so on.

When preparing for the seminar, the topics and contents had been discussed with hosting groups and the interest of both were covered as much as possible. The topics of the seminar had been chosen to suit the working themes in TC and common interests such as 'road condition monitoring and road/vehicle interaction', 'recycling and reuse of materials for pavements' and 'reducing the life-cycle carbon foot print of pavements'. Furthermore, one topic, 'strategies and methods to ensure long service life of pavements', was included by the request of hosting groups.

The seminar was composed of 4 sessions under the topics and there were discussion time at the end of each session. 20 presentations were made in the seminar - almost a half of them were from TC members while the other half were from Latin group. At the beginning of the seminar, the Minister of Transport in Ecuador, Madam Paola Carvajal delivered an opening speech and then the chair of TC, Seung-Hwan Han gave a PIARC institutional presentation in order to encourage Latin American group to participate in the PIARC activities.

There was active participation from the audience and local road engineers by questioning and discussing together in the discussion time at the end of each session. Several examples were shared among the engineers for implementing the technologies on 'quality control of road condition monitoring' and 'strategies for reducing carbon foot print'. It was special one [a1] that local engineers were so much interested in the use of recycled rubber materials in asphalt binder. Some members introduced their experiences and encouraged others to apply them in the construction fields.

After two days of seminar, the technical tour on road construction project was given. It could be understood that a special consideration was given to local construction environments in the fields. For instance, slop stabilizing technologies were used due to the high altitude of construction sites and volcanic rocks and soil.

We could identify similarities and differences in pavement engineering among participating engineers during the seminar. The efforts for adapting their technological endeavors to the local situations were so precious. The gaps between regions could be narrowed down through this kind of joint seminars and frequent discussions among members of PIARC TC.



Figure 10. Logos of Quito seminar



Figure 11. Photos of presentations



Figure 12. Photos of Minister's welcoming address and technical tour

5. OUTCOMES OF TC 4.2; REPORTS AND GUIDELINES

5.1. Report on “State of the Art in Monitoring Road Condition and Road/Vehicle Interaction”

Road pavements comprise a major component of public infrastructure, and are designed to have long service lives delivering safe, smooth, all-weather access for people and goods.

Assessing the condition of pavements after construction allows a comparison of the characteristics of the constructed pavements to be made against the design goals. Over their long life span the condition of these pavement assets is usually monitored by road owners to ensure that the pavements are providing the expected efficient and safe travel conditions for which they were designed. If condition monitoring indicates that the desired performance of the pavement is being compromised, collected condition information can be used to identify the cause of the problem, assist in the design of treatments, and in prioritising the application of those treatments in the most efficient manner within operational and budget constraints.

Nearing the end of the operational life of the pavement, collected condition parameters can be used as an input into the selection and design of rehabilitation or re-construction options.

Beyond these broad uses condition data can also be utilised to:

- assess the quality of construction
- benchmark current condition
- measure the changes in performance over time, informing the prediction of future condition
- fulfil requirements to report asset value and indicators of network performance
- assess the performance of service providers
- guide the selection of future maintenance and replacement needs.

This report summarises the current state of the art regarding the collection of road condition and road/vehicle interaction data. It aims to provide an overview of current practice and emerging technologies. The use of condition data is generally described but, as noted above, the uses of data are widespread with each worthy of separate discussion. The report’s scope is limited to the description of indicators that are derived from condition data, and where appropriate provides examples of the use of those indicators in decision making.

Technologies in the development and experimental stages are largely not discussed. The document is intended to concisely inform the reader of the range of technologies available, and not to replicate the considerable detail that is available elsewhere for specific technologies. The report does not include specific discussion of assessing winter conditions, leaving such discussion to more specialised documents.

5.2. Report on “Expected Service Life of Wearing Courses”

As part of its 2012 to 2015 strategic plan the World Road Association (PIARC) determined the need to indentify and review approaches taken in assessing the service life of wearing courses. This report reviews the different approaches taken by road authorities to determine the service life of wearing courses. The aim is to understand why they are replaced and identify the factors which affect decision making.

The service life of a wearing course depends on several factors such as the type of wearing course, the amount of traffic, the climate and the base layer construction. The definition of service life can also vary from country to country. In this report we assume that any distress (e.g. roughness, rutting, and cracking) can be a determining factor to declare the end of life of a wearing course.

The survey is also restricted to “normal” roads. The wearing courses of special pavements, such as those used on bicycle paths, roundabouts, bridges, etc. can have a different behaviour and are not considered in this report. Only the service life of asphalt, concrete and pavements with surface dressings are considered.

The information presented in this report was collected using a questionnaire. This report describes the questionnaire, the responses to the questionnaire and a short analysis of the results.

Finally, three case studies are added which go into more detail and describe different approaches to determine the end of service life.

5.3. PIARC Guideline on “Reuse & Recycling of Pavement Materials”

It has been more than 10 years since PIARC guidelines on the reuse & recycling of road pavement materials were established in 2003. Concerning sustainability of pavement engineering, this topic has been focused consistently around the world. There have been so many efforts made to enhance the related technologies. Thus, the guidelines need to be updated and upgraded. In other words, some new technologies should replace old ones in new guidelines based on new research results.

New guidelines contain mainly 5 chapters such as ‘introduction’, ‘in-place recycling with cement’, ‘in-place recycling and re-use with emulsion/foamed bitumen’, ‘recycling & reuse of asphalt mixture’ and ‘recycling & reuse of concrete pavements’. Among these, ‘recycling & reuse of concrete pavements’ is new, not covered in old guidelines.

The target reader of this is technical practitioners with pavement engineering background. Thus, it is not necessary to describe the basic concepts and knowledge in these guidelines.

As described in older version, the selection of recycling methodology is depending on technical, environmental and economical issues. Approaches are different from country to country influenced by national needs, requirements, technologies and resources, etc. In these guidelines, the choice for recycling technique is not made. Each country has to do so suiting its technical needs for rehabilitation or maintenance, new functions of the road, national policies for sustainable development and economical considerations.

5.4. Report on “Reducing the Life Cycle Carbon Footprint of Pavement”

The working Group objectives established by PIARC are to report on innovations leading to the reduction of carbon footprint of pavements. It is recognised that there are numerous other environmental indicators for road pavements, but these are considered outside the scope of this report which will focus solely upon carbon footprint.

The objectives set were as follows;

- Review field feedback on recent innovations (products, equipment) which contribute to reduce the carbon footprint in pavements. This will include in particular warm asphalt concrete technologies.
- Critical review of the assessment of reductions in the carbon footprint as compared to standard methods of construction including the use of reused, recycled and recovered materials.

In this report, the definition of sustainability of road pavement and carbon footprint were discussed. It was also needed to define the system boundaries and allocation methodologies for comparing and reviewing the models available to produce carbon footprint around the world. Several models such as ECORCE, HACCT, asPECT, GHGC, CAHNGER, SEVE PALATE, DUBOCALC, and CEREAL are reviewed in considering what stages they can cover and what sort of outputs they can produce.

In an effort to find out the status of this technology in different countries, the responses of questionnaire were investigated and the results were summarized in the report. It should be noted that several of the responses were, most likely, positive in respect of sustainability, although they do not necessarily reduce the CF of the road pavement. Moreover, in most of the examples provided, no data were presented to demonstrate that the innovation did actually reduce the CF of the pavement.

Some technologies of innovations to reduce carbon footprint were examined in road pavement construction. These include ‘dry stockpiles for asphalt production’, ‘warm mix asphalt(WMA)’, ‘re-use, recycled and secondary material use’, ‘two-layer concrete pavement’ and ‘some technologies for construction’.

The responses from the questionnaires indicate that there are currently no incentives provided by the road owners to encourage the adoption of lower CF pavements. Two responses from the questionnaire suggested that lower CF pavements may lead to cost reductions for the manufacturers of pavement materials due to e.g. fuel savings and the use of recovered or recycled materials.

From the responses to questionnaire, it is apparent that, although most countries have a national action plan to reduce emissions of GHG, at the time of writing the majority do not include road pavements in that action plan. Accordingly, the majority of road owners do not currently consider CF as a specific issue to be addressed in the procurement process.

In a few countries, models are available and used, for assessing CF of various solutions for specific projects. However, only the Netherlands routinely uses such models as part of the bid selection process.

This report only evaluated CF of road pavements. However, it is recommended that future projects should consider other environmental end points relevant to sustainability. This could be achieved by evaluating the Life-Cycle Inventory (LCI) or Life-Cycle analysis

(LCA). In addition, this report only discussed the pavement construction, whereas the majority of the emissions associated with pavement come from the vehicles that use it. Future studies should take into account potential benefits from the pavement in reducing vehicle emissions, e.g. by reducing rolling resistance.

6. TC SESSION AND WORKSHOP IN CONGRESS

There will be a TC 4.2 session for about 4 hours on the fourth day of World Road Congress. In this session, the outcomes of TC 4.2 described in the previous chapter will be presented to the audience as well as members. The output will be shared and disseminated to the engineers participating in the Congress. And two invited papers will be also presented, which are the prized papers from TC 4.2.

As collaboration with regional groups such as REAAA and Korean working group, the workshop on “reuse and recycling of pavement materials” related to the working theme 2, will be held on the second day of the World Road Congress. This will be fairly good to disseminate the outcomes of TC 4.2 and share the information of pavement knowledge. The detailed programs of TC session and workshop are described in the appendix.

- TC session : 15:00-18:40, November 5 (Thursday), 2015
- Workshop on recycling : 15:00-18:40, November 3 (Tuesday), 2015

6.1. TC Pre-Session in Congress

TC4.2 “Road Pavements”	
Tuesday, 3 November 2015, 09:00-10:50, Room: CH11	
Chair: Mr. Seung-Hwan HAN, Korea Expressway Corporation, KOREA	
09:00-09:20	Introduction and Plenary Meeting Chair Mr. Seung-Hwan HAN
09:20-10:10	Preparation of TC Session <ul style="list-style-type: none"> · Mr. Michael MOFFATT, Australian Road Research Board(ARRB) Group, AUSTRALIA · Mr. Leif SJÖGREN, Swedish National Road and Transport Research Institute, SWEDEN · Mr. Margo BRIESSINCK, Mobility and Public Works, Flemish Government, BELGIUM · Mr. Mats WENDEL, Peab Asfalt AB, SWEDEN · Mr. Mario KRMEK, Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft (ASFiNAG), AUSTRIA · Mr. Mike SOUTHERN, EUROBITUME, BELGIUM · Mr. Pascal ROSSIGNY, Ministère de L’Écologie, du Développement Durable et de L’ Énergie, FRANCE · Mr. Johan MAECK, Belgian Road Research Centre, BELGIUM
10:10-10:40	Preparation of Workshop <ul style="list-style-type: none"> · Mr. Mats WENDEL, Peab Asfalt AB, SWEDEN · Mr. Joralf AURSTAD, Norwegian Public Roads Administration, NORWAY · Mr. Keizo KAMIYA, Nexco Research Institute, JAPAN

	<ul style="list-style-type: none"> Mr. Yong-Joo KIM, Korea Institute of Civil Engineering and Building Technology, KOREA
10 :40-10:50	Conclusion Chair Mr. Seung-Hwan HAN

6.2. TC Session in Congress

TC4.2 “Road Pavements”	
Thursday, 5 November 2015, 15:00-18:40, Room: CH4	
Chair: Mr. Seung-Hwan HAN, Korea Expressway Corporation, KOREA Co-chair: Mr. Bonoit PETITCLERC, Ministry of Transport of Quebec-CANADA	
15:00-15:20	Introduction and Activities of TC 4.2 <ul style="list-style-type: none"> Chair Mr. Seung-Hwan HAN
15:20-16:20	State of the art in Monitoring Road Condition and Road/Vehicle Interaction <ul style="list-style-type: none"> Mr. Michael MOFFATT, Australian Road Research Board(ARRB) Group, AUSTRALIA Overall Quality Management of Road Condition monitoring : A Case Study <ul style="list-style-type: none"> Mr. Leif SJÖGREN, Swedish National Road and Transport Research Institute, SWEDEN Expected Service Life of Wearing Courses <ul style="list-style-type: none"> Mr. Margo BRIESSINCK, Mobility and Public Works, Flemish Government, BELGIUM Questions and Discussion
16:20-16:30	Poster Introduction <ul style="list-style-type: none"> Chair Mr. Seung-Hwan HAN,
16:30-17:00	Break
17:00-17:40	The PIARC Pavement Recycling Guidelines <ul style="list-style-type: none"> Mr. Mats WENDEL, Peab Asphalt AB, SWEDEN Recycling of Concrete Roads : A Case Study <ul style="list-style-type: none"> Mr. Mario KRMEK, Autobahnen- und Schnellstraßen- Finanzierungs- Aktiengesellschaft (ASFiNAG), AUSTRIA Questions and Discussion
17:40-18:30	Review of Practises to Assess and Reduce Carbon Footprint of Pavements <ul style="list-style-type: none"> Mr. Mike SOUTHERN, EUROBITUME, BELGIUM Mr. Pascal ROSSIGNY, Ministère de L'Écologie, du Développement Durable et de L' Énergie, FRANCE Methodology and Case Study for Carbon Footprint Estimation <ul style="list-style-type: none"> Mr. Johan MAECK, Belgian Road Research Centre, BELGIUM Questions and Discussion
18 :30-18:40	Conclusion Chair Mr. Seung-Hwan HAN

6.3. Joint Workshop in Congress

TC4.2 “Reuse and Recycling of Pavement Materials”	
Tuesday, 3 November 2015, 15:00-18:40, Room: CH7	
Chair: Mr. Mats WENDEL, Peab Asphalt AB, SWEDEN	
15:00-15:20	Greeting from Organizations <ul style="list-style-type: none"> · PIARC TC 4.2 Chair Mr. Seung-Hwan HAN · REAAA TC 2 Chair , Mr. Yasumasa TORII, · Korean Research Group Leader Mr. Soo-Ahn KWON,
15:20-15:30	Introduction of Workshop <ul style="list-style-type: none"> · Chair Mr. Mats WENDEL
15:30-16:30	The PIARC Activities for Pavement Recycling <ul style="list-style-type: none"> · Chair Mr. Mats WENDEL Global Overview of Recycling <ul style="list-style-type: none"> · Mr. Joralf AURSTAD, Norwegian Public Roads Administration, NORWAY Questions and Discussion
16:30-17:00	Break
17:00-18:20	Asian Recycling and New Ageing Evaluation Method <ul style="list-style-type: none"> · Mr. Kazuyuki KUBO, Public Works Research Institute, JAPAN · Mr. Keizo KAMIYA, Nippon Expressway Company Research Institute (RI-NEXCO), JAPAN Current Status and Prospect of Asphalt Pavement Recycling in KOREA <ul style="list-style-type: none"> · Mr. Yong-Joo KIM, Korea Institute of Civil Engineering and Building Technology, KOREA Questions and Discussion
18 :20-18:30	Conclusion <ul style="list-style-type: none"> · Chair Mr. Mats WENDEL

7. CONCLUSIONS

Pavement technology has been a focus of attention from the early days of road construction because its performance is directly related to the comfortability of road users. Accordingly, many road agencies around the world are putting emphasis on this among several road engineering fields even though they have a different view on it. Meanwhile, in developing countries, there was a need for economical technology that can ensure good performance. On the other hand, maintenance and rehabilitation technologies are more dealt in developed countries as the building of new infrastructure has almost been complete in those countries. Still, the two areas should be handled in most countries though the circumstances are different. It seems that the high level of interest was reflected in the number of active members in TC. Even though there is a deficiency in terms of continuity of TC from the former cycle, it could be successfully overcome by the qualified members.

The arrangement of TC meeting and joint seminars was well evaluated thanks to the valuable support by hosting countries such as France, US, Malaysia, Belgium, China, Ecuador and Germany. Especially, the joint seminar with China and Ecuador (including Latin Working Group) was very successful in the number of participants and its contents. More than 200 and 400 people attended the Beijing and Quito seminars respectively. The local issues were asked to speakers from TC and discussed intensively during the seminar. For instance, the engineers from Beijing were interested in condition monitoring technologies in network-level maintenance while those from Quito had a great concern about the recycling technologies based on local materials.

The three working themes are fulfilled in this cycle with active participation of members around the world. These strategic themes were defined before setting up the TC members and working groups in TC. Thus, they were carefully performed to what is in/ out of scope in the first hand. Each item has been studied and discussed through TC meetings, working group meetings and email exchanges after breaking down what to do. Some members kindly volunteered to have extra working group meetings. Furthermore, participating the joint international seminars with host countries in China and Ecuador also inspired the members to share and get information on these themes. The expected outcomes can be attained by the efforts of all members and working group leaders.

In order to have more fruitful outcomes of TC, it is recommended to find out a way to ensure the participation of active members by lessening the burden of their participation in terms of cost and time. Also, the term of reference, covering the working themes of the next cycle, should be circulated to the members and member countries so that they can nominate appropriate members and let them prepare before a new cycle starts. Finally, as continuity is very important, one or two persons at least who was/were the last chair or secretaries may be kept in a new cycle.

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**TECHNICAL COMMITTEE 4.3
ROAD BRIDGES**

2012-2015 ACTIVITY REPORT

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Issue 4.3.3:

Argentina, Canada-Québec, Belgium-Wallonia, France, Hungary, Japan, South-Korea, New Zealand, Norway, Spain and United Kingdom

Countries having responded to the questionnaires prepared by Group 2 :

Issue 4.3.2:

Argentina, Belgium-Wallonia, Canada-Quebec, Denmark, France, Italy, Ireland, Japan, Poland, Spain, United Kingdom and USA

Countries having responded to the questionnaires prepared by Group 3 :

Issue 4.3.4:

Argentina, Austria, Belgium-Wallonia, Canada-Québec, Czech Republic, Denmark, Hungary, Japan, South-Korea, Mexico, Romania, Slovenia, Spain, Switzerland, UK-England, UK- Hertfordshire, USA-FHWA and USA-Wisconsin

1. INTRODUCTION AND CONTENTS

1.1. Introduction

The purpose of this Activity Report is to present an overview of the work contributed by Technical Committee 4.3 during the period of 2012-2015.

1.1.1. Technical Committee Meeting

Since the kick-off meeting in Paris, March 2012, the Committee has had 8 meetings. Each of them was organized by different Technical Committee members and supported by their respective governments, institutions, and organizations.

The date and place of eight meetings were as follows:

Meeting 1	March 2012	Paris (France)
Meeting 2	October 2012	Madrid (Spain)
Meeting 3	May 2013	Bergen (Norway)
Meeting 4	November 2013	Kobe (Japan)
Meeting 5	February 2014	Andorra La Villa (Andorra)
Meeting 6	October 2014	Shanghai (China)
Meeting 7	May 2015	Bucharest (Romania)
Meeting 8	November 2015	Seoul (Korea)

1.1.2. Roads bridge sessions in the winter world road congress

Two technical sessions were organized by Technical Committee 4.3 in the 14th International Winter Road Congress (Andorra La Villa, February 2014).

- Impact of de-icing salts on bridges, alternative deicing methods, and measures for protection
- Design and management of specific elements under winter conditions (expansion joints, barriers, cables, curbs)



Bridge session in the 14th International Winter Road Congress (Andorra La Villa).

There were 11 papers to be submitted to the congress. Within 11 papers, 8 papers were presented during the congress. 8 papers presented were as follows,

- 1) Risk management of concrete road bridges subject to de-icing salts and the possible implications of climate change (UK)
- 2) Assessment of the harmful effects of road salt on the structural states of the bridges in the principality of Andorra (Andorra)
- 3) Stage protection against degradation due to the use of de-icing salts of a structure in Andorra (Spain, Andorra)
- 4) Assessment and repair of bridges subject to de-icing salts (Denmark)
- 5) The effect of silane-type penetrants to control scaling and salt damage of highway bridge wheel guard concrete in cold region (Japan)
- 6) Experimental study on deterioration characteristics of partially repaired slabs under freezing-thawing and fatigue combined action (Japan)
- 7) Winter service on the bridges in A2 motorway in Croatia as a part of sustainable development (Croatia)
- 8) Study into the damage to various concrete bridges decks with intensive winter maintenance (Spain)

At the closing ceremony, the conclusions from two sessions were presented by the chair during the closing ceremony as follows,

- In cold region, it is very important to prevent de-icing salt penetration into concrete. In order to avoid that, it is necessary to provide the water proof system and effective protection at the expansion joint.
- Once salty water penetrates into concrete, it will not go out. Therefore, it is important to repair in the early stage of deterioration
- It may reduce the use of de-icing salts if the temperature of each bridge is considered.

1.1.3. PIARC International Seminar

In response to PIARC recommendations, this committee devoted their efforts to organize two seminars in a developing or a transition country. One was held in Shanghai, China in October 2014, and the other seminar was held in Bucharest, Romania in May 2015.

Summary of two seminars are as follows:

(1) International seminar in Shanghai, China

Title: International Seminar on Long Span Bridge

Date: 23rd - 25th October 2014

Place: Shanghai, China

Organized in Cooperation by: PIARC Technical Committee 4.3 of 'Road Bridges'
CCCC Highway Consultants Co. Ltd

Undertook by: BRIDGE Magazine
CCCC Highway Bridges National Engineering Research Centre



Seminar in Shanghai, China



Technical visit to the Sutong bridge

(2) International seminar in Bucharest, Romania

Title: International Seminar on Maintenance of Bridges

Date: 28th - 30th May 2015

Place: Bucharest, Romania

Organized in Cooperation by: PIARC Technical Committee 4.3 of 'Road Bridges'
A.P.D.P. ROMANIA

Undertook by: ROADS AND BRIDGES Magazine



Seminar in Bucharest, Romania



Technical visit to the Basarab Overpass

1.1.4. Technical Committee Reports

Technical Committee 4.3 prepared four reports for assigned issues by PIARC as follows:

“Adaptation to climate change”

“New repair and rehabilitation methods”

“Risk-based management of the bridge stock”

“Estimation of load carrying capacity of bridges based on damage and deficiency”

These four reports were based on the works by three working groups for four year periods. The four reports will be published in 2015 and the details of four reports will be presented during the World Congress in Seoul Korea.

1.1.5. Papers in Routes/Roads;

Based on the technical report, “Estimation of load carrying capacity of bridges based on damage and deficiency” is published on Routes/Roads in 2015.

1.2. Contents

This Activity Report includes the list of active committee members, the list of meetings arranged during the four year period, comments concerning the three work groups for the four issues assigned by PIARC, a synthesis of the work and conclusions and recommendations. The work program, which was prepared by the Committee and which directed the committee’s work, is presented in Figure 1.



Kick-off meeting in Paris, France

2.2. 2nd meeting

During the 2nd meeting in Madrid, drafts of questionnaires were discussed. Progress with respect to each group during the meeting was as follows.

- (1) Group 1 (Issue 4.3.1: Adaptation to climate change and Issue 4.3.3: Risk-based management of the bridge stock)
 - Review literature
 - Prepare short report on administrations' approach to risk based management of the bridge stock
 - Submit draft questions for a proposed questionnaire
- (2) Group 2 (Issue 4.3.2: New repair and rehabilitation methods)
 - 30 responses from 22 countries were received from the 1st questionnaire
 - A list of degradation problems was compiled
- (3) Group 3 (Issue 4.3.4: Estimation of load carrying capacity of bridges based on damage and deficiency)
 - Draft of the 1st questionnaire



2nd meeting in Madrid, Spain

2.3. 3rd meeting

At the 3rd meeting in Bergen, the final formats of the questionnaires were discussed in order to finalize them for distribution. Progress with respect to each group during the meeting was as follows.

- (1) Group 1 (Issue 4.3.1: Adaptation to climate change and Issue 4.3.3: Risk-based management of the bridge stock)
Review documents on Risk Analysis of Tunnels and the IPCC report
- (2) Group 2 (Issue 4.3.2: New repair and rehabilitation methods)
A list of 41 degradation problems was compiled
- (3) Group 3 (Issue 4.3.4: Estimation of load carrying capacity of bridges based on damage and deficiency)
Finalize the questionnaire



3rd meeting in Bergen, Norway

2.4. 4th meeting

Each group received responses from PIARC member countries and reviewed the responses during the 4th meeting in Kobe. In addition, the contents of final reports were discussed. Progress with respect to each group was as follows.

- (1) Group 1 (Issue 4.3.1: Adaptation to climate change and Issue 4.3.3: Risk-based management of the bridge stock)
The questionnaire was finalized and a draft table of contents of the report was compiled
- (2) Group 2 (Issue 4.3.2: New repair and rehabilitation methods)
The 44 standard and 41 alternative methods reported so far through the questionnaire process were analyzed. A draft table of contents of the report was compiled
- (3) Group 3 (Issue 4.3.4: Estimation of load carrying capacity of bridges based on damage and deficiency)
The 15 responses to the questionnaire were compiled in one document



4th meeting in Kobe, Japan

2.5. 5th meeting

At the 5th meeting in Andorra La Villa, the organization and content of final reports was discussed. It was confirmed that four reports would be prepared as follows:

Report 1: Adaptation to climate change

Report 2: New repair and rehabilitation methods

Report 3: Risk-based management of the bridge stock

Report 4: Estimation of load carrying capacity of bridges based on damage and deficiency

Progress with respect to each group was as follows.

(1) Group 1 (Issue 4.3.1: Adaptation to climate change and Issue 4.3.3: Risk-based management of the bridge stock)

Table of contents were finalized and responsibilities for each sections were assigned.

(2) Group 2 (Issue 4.3.2: New repair and rehabilitation methods)

All answers were analyzed and the table of contents was finalized.

(3) Group 3 (Issue 4.3.4: Estimation of load carrying capacity of bridges based on damage and deficiency)

Discuss main findings and complete drafts of conclusions



5th meeting in Andorra city, Andorra

2.6. 6th meeting

At the 6th meeting in Shanghai, China, responsibility for translation and quality control was assigned to the following members:

It was confirmed that all three groups were to prepare final reports, review them and translate them into French and Spanish by March 15th, 2015. Progress with respect to each group were as follows.

- (1) Group 1 (Issue 4.3.1: Adaptation to climate change and Issue 4.3.3: Risk-based management of the bridge stock)
Contents of the final report were discussed and it was confirmed to complete the final report by December 15, 2014. .
- (2) Group 2 (Issue 4.3.2: New repair and rehabilitation methods)
The final draft was carefully reviewed by all group members.
- (3) Group 3 (Issue 4.3.4: Estimation of load carrying capacity of bridges based on damage and deficiency)
The final draft was carefully reviewed by all group members.



6th meeting in Shanghai, China

2.7. 7th meeting

At the 7th meeting in Bucharest, Romania, the program of TC Session at the Seoul Congress was discussed and finalized. Three papers were selected to address the session at the Congress in Seoul as follows:

Title 1: Asset management of Honshu-Shikoku Bridges (Japan)

Title 2: Intervention in masonry arch bridges, safety barriers and bearing in existing bridges (Spain)

Title 3: A proposal of a new type of precast bridge deck connection (Korea)



7th meeting in Bucharest, Romania

2.8. TC4.3 Road Bridges Committee Members and their Contributions

TC4.3 members and their attendance are shown in the next pages.

	Name	Status ¹⁾	Country	Group	Attendance to Meetings ²⁾							
					1st	2nd	3rd	4th	5th	6th	7th	
1	KASHIMA Satoshi	Chair	Japan									
2	KONSTANTINIDIS Dimitrios	Sec.(E), Terminology	Greece	1								
3	BELANGER Louis-Marie	Sec.(F)	Canada-Quebec	2								
4	DIAZ SIMAL Pablo	Sec.(S)	Spain	3								
5	GILLES Pierre	Webmaster Leader	Belgium	2								
6	OULD SLIMANE Karima	M.	Algeria									
7	CASTELLI Eduardo	M.	Argentina	1								
8	KIRCHMAIR Martin	M.	Austria	3								
9	KOLLEGER Johann	M.	Austria	3								
10	HOUDART Sebastien	A.M.	Belgium	2								
11	PECOUET Etienne	A.M.	Belgium	2								
12	AGUEMON Germain	C.M.	Benin									
13	RIOJA VALDA Marcelo Ruperto	M.	Bolivia									
14	ILBOUDO Moumouni	M.	Burkina Faso									
15	KABORE Ibrahim	M.	Burkina Faso									
16	LEUKEFACK Virginie	M.	Cameroon	1								
17	NDOUDOU MOU Olivier	M.	Cameroon									
18	DEBLOIS Rene	M.	Canada	3								
19	AISSI Marione Edwige	A.M.	Canada-Quebec									

	Name	Status ¹⁾	Country	Group	Attendance to Meetings ²⁾						
					1st	2nd	3rd	4th	5th	6th	7th
20	CAMPUSANO OSORIO Jorge	M.	Chile								
21	LEIVA Gilberto	C.M.	Chile								
22	SILVA ROCO Gustavo	C.M.	Chile								
23	MAROUZ MARAMBIO Marcelo	A.M.	Chile								
24	VALENZUELA SAAVEDRA Matias	A.M.	Chile								
25	XU Hamg	M.	China	3							
26	BIKOUMOU Joseph	M.	Congo								
27	SITA Rene Bernard	C.M.	Congo								
28	OLEA Lambert	A.M.	Congo								
29	ROGES FABREGAS Raul	C.M.	Cuba								
30	HVIDDAL Vaclav	C.M.	Czech Republic	3							
31	VOLEK Jan	C.M.	Czech Republic								
32	NIELSEN Henrik	M.	Denmark	2							
33	RYTKONEN Antti	C.M.	Finland								
34	LLOP Laurent	M. Co-leader	France	1							
35	KRETZ Thierry	A.M.	France	1							
36	MOLNAR Istvan	M.	Hungary	1							
37	URBAN Tamas	C.M.	Hungary	2							
38	AKBARI Reza	M.	Iran	3							
39	JALALIAN Karim	C.M.	Iran								
40	EMAD Kiomars	A.M.	Iran								
41	MELE Michele	M. Co-leader	Italy, Co-leader	2							
42	IMAI Kiyohiro	M. Leader	Japan, Leader	3							
43	TAMAKOSHI Takashi	C.M.	Japan								
44	SATO Yoichi	A.M.	Japan	2							
45	RASOAVAHINY Justine	C.M.	Madagascar								
46	RAZAFINDRABE Jacky Delphin	C.M.	Madagascar								
47	ISMAIL BIN MOHAMED Taib	M.	Malaysia	1							
48	SAFWAN FAKHRIN MOHD B. MOHD	M.	Malaysia	2							
49	DIALLO Boubacar Hassimi	M.	Mali								
50	TRAORE Siaka	C.M.	Mali								
51	FRIAS ALDARACA Ruben	M.	Mexico	1							
52	TORRES ACOSTA Andres	C.M.	Mexico								
53	ABDELLAOUI Khalid	M.	Morocco								
54	MOUBARRAE Abdelfattah	C.M.	Morocco								
55	SCHAAFSMA Dick	M.	Netherlands	2							
56	REID Kevin	M.	New Zealand	1							
57	NAKOIRA ABBA Mahamadou Bachirou	M.	Niger	3							
58	STENSVOLD Borre	M. Leader	Norway	1							
59	ROSIK Artur	M.	Poland	2							
60	FREIRE Luis	M.	Portugal								
61	BOTA Adrian	M.	Romania	3							
62	RAICU Marian	C.M.	Romania	1							
63	AL-BABTAIN Ibrahim Ahmed	M.	Soudi Arabia								
64	ALDOSARI Fahad Mansour	M.	Soudi Arabia								
65	KOSIK Dusan	C.M.	Slovak Republic	3							
66	NAD Ludovit	C.M.	Slovak Republic	1							
67	ZNIDARIC Ales	M.	Slovenia	3							
68	KAVCIC Franci	C.M.	Slovenia								
69	LOURENS Elma	M.	South Africa	2							
70	GIL Heungbae	M.	South Korea	1							

	Name	Status ¹⁾	Country	Group	Attendance to Meetings ²⁾						
					1st	2nd	3rd	4th	5th	6th	7th
71	CHOI Hyun-Ho	C.M.	South Korea	1							
72	LEE Byung-Kook	A.M.	South Korea								
73	SHIN Seung-Kyo	A.M.	South Korea								
74	ARIAS HOFMAN Gonzalo	M.	Spain	2							
75	NAVARENO ROJO Alvaro	M.	Spain	1							
76	ALVAREZ Manuel	M.	Switzerland	3							
77	ASHURST David	M.	United Kingdom	2							
78	HILL Mike	C.M.	United Kingdom								
79	BABCOCK Charles	M.	United States	1							
80	BECKER Scot	M. Co-leader	United States	3							
81	EVERETT Thomas	A.M.	United States	2							
82	HARTMANN Joey	A.M.	United States	3							
83	MUGABE Benox	M.	Zimbabwe								
84	RUSERE Tonderai	M.	Zimbabwe								

Note:

1) Sec. (E), English speaking secretary, Sec. (F): French speaking secretary, Sec.(S): Spanish speaking secretary, M: Member, C.M.: Corresponding member, A. M.: Associated member

2) "o" indicates participation in TC D.3 meetings.

3. WORKING GROUP 1 AND ITS APPROACH

Group 1 undertook two issues including "Management of the bridge stock" and "Adaptation to climate change". Questionnaires were prepared and distributed to bridge authorities in member countries of PIARC Technical Committee D.3 – Road Bridges. Based on the responses, two reports were prepared by Group 1. The approach taken in preparing the two reports is as follows:

Adaptation to climate change

Climate change has now become a global issue of concern. Because of this reason, PIARC has incorporated it into the strategic themes and technical committees for the term 2012-2015. Higher levels of carbon-dioxide as part of greenhouse gas emissions are being released resulting in heat being trapped in the atmosphere, which over time will result in a rise in the earth's air temperature. This rise in temperature will filter into the oceans causing sea water to expand and therefore raise sea levels. There are already signs of extreme weather occurring in certain parts of the world resulting in events like drought, heavy rainfall, flooding, typhoons and violent storms and in addition landslides, rock falls, mudflows, avalanches and glacier melting. The frequencies of some of these events are also increasing.

The documents on climate changes and its effects on road bridges were reviewed. However, limited information is available on the quantitative effects of climate changes as follows.

The Intergovernmental Panel on Climate Change (IPCC) published a series of Assessment Reports (AR) on climate change. The socio-economic aspects of climate change and its implications for sustainable development are mainly dealt in the Reports. The numbers of climate change phenomena are mentioned in the Report. With regard to road bridges, concerns are the temperature changes causing expansion and contraction of bridge superstructures, frequency and intensity of precipitation (causing major flooding), and sea level rise.

In the last term of Technical Committee, thirteen countries or states from five continents responded to the study on climate change and its impacts on road bridges. In general, there are extreme natural events being experienced in many countries resulting in loss of lives and loss or damage to infrastructure. Importantly however, most countries cannot qualify that these events are as a result of climate change. The effects on road bridges are not clear yet.

As possible future work the committee recommends to study any provisions made by countries in the planning and implementation phases of projects to consider limiting a project's impact to climate change, particularly in bridge design, construction and maintenance.

Risk-based management of the bridge stock

The risk is a potential hazard or threat, more or less predictable, which can affect the performances of a structure. Risk is therefore the combination of the probability of this hazard and the magnitude of the induced consequences. Actually, it is the expected cost of undesirable consequences.

Risk analysis is a process used to identify hazards and consequences, to estimate risks and to evaluate various alternatives for its management.

The term "Risk Analysis" covers a large variety of approaches, methods and complex models dedicated to specific tasks. It is a systematic approach to analyse sequences and interrelations in potential incidents or accidents (hazards), hereby identifying weak points in the system and consequences of the failure, in order to recognize possible improvements. Risk analysis can include a quantification of risks, which can be used as the basis of a performance-based approach to safety.

Risk analysis and risk mitigation are embedded in all bridge management systems, as the primary objective of bridge management is to ensure the safety and serviceability of bridges at the minimum cost. Answers to the questionnaire, summarized in appendix, shows how this concept is widely developed in the different countries. We will present them in chapter two of this report.

But risk analysis as a standardized methodology is constrained and shall explicitly consider and combine three notions: hazards (events that may happen), vulnerability (behaviour of the structure facing a hazard) and consequences (of total or partial structural failure). France has produced guidelines for the application of risk analysis [3] and applied them, for example, to some bridges that appeared excessively vulnerable to corrosion of prestressing cables. These guidelines and their application are described in chapter three.

Risk analysis has been applied in different countries to consider the risk of structural failure facing earthquakes. This report will develop two examples, one from France and the second from Japan. A few other examples have been developed and are presented : scour, fire, wind (for traffic safety). These specific applications are presented in the following chapters.

The report concludes with some considerations concerning the application of risk analysis to the assessment of the consequences of climate change. Though this idea is promising, its application is limited, at the moment, by the difficulty to assess the increase of natural hazards (scour, flooding, wind, extreme temperature) due to climate change.

4. WORKING GROUP 2 AND ITS APPROACH

This report sets out to present a collation of comparative information related to rehabilitation methods in use as provided by international participants, in response to questionnaires. The report focuses on permanent rehabilitation methods and excludes temporary solutions.

All bridge owners have to face bridge stock degradation. Reduced funding and road congestion impose increasing challenges for the engineer, who has to select rehabilitation methods taking into account:

- Reliability: will the technical performance of the method comply with specification requirements throughout the bridge's lifetime? This is related also to the robustness of the method.
- Availability: does the rehabilitation method impose minimal traffic hindrance?
- Maintainability: does the method require minimal maintenance or monitoring during its service life?
- Safety: is it safe in execution and use? Are there any specific safety procedures to be followed during the execution, the inspection and/or the maintenance of the rehabilitation method?
- Finance: is the method acceptably viable, taking account of both initial and lifecycle costs?
- Sustainability: what is the impact of this rehabilitation method compared to others on the lifecycle of the bridge?

The scope of this report also concerns the innovative aspect of each rehabilitation method. Innovation could be embodied in the technique itself, for example, perhaps by the way it takes traffic into account, and/or by the reduction of the ecological footprint.

Faced with similar problems, bridge owners from different countries may use different methods to rehabilitate their bridges. The scope of this report is to compare these methods and to provide information to aid in comparative evaluation. With this report, we hope bridge owners will be better informed to choose the best solution.

5. WORKING GROUP 3 AND ITS APPROACH

Working group 3 has completed a study which presents and compares basic bridge inspection procedure, bridge inspection practice, estimation of bridge load carrying capacity, and traffic restriction in different countries or regions. These are all important components of the estimation of load carrying capacity of bridges based on damage and deficiency.

Bridge inspection procedure is compared using codes/directives/manuals and a flow chart of bridge inspection procedure.

Bridge inspection practice among different countries is described including types and frequencies of bridge inspections, bridge inspection personal, contents of routine/visual inspections, and condition state indices which are currently applied to bridges in different road authorities.

Current practice associated with the estimation of load carrying capacity of bridges is collected with respect to use of visual/routine inspection data, personal that performs the load carrying capacity evaluation, use of special inspection, assessment or additional field survey, methods and procedures to apply additional field data, and improvement in the current practice.

Methods and examples of traffic restriction are presented and important findings are picked up based on the information such as collection of actual field load data, traffic restriction or load post on bridges, decision making for traffic restriction, and alternative measures to avoid traffic restrictions.

6. CONCLUSIONS

Following the work developed by the committee in the four issues, some conclusions can be presented according to four reports:

- Regarding Adaptation to climate change:

The documents on climate changes and its effects on road bridges were reviewed. However, limited information is available on the quantitative effects of climate changes. The IPCC report and other documents does point out that the bridges can be affected by climate changes. Scour due to increased sea level and flood due to heavy precipitation was cited as the most common impact on highway bridges. Heavy precipitation can also cause land movement and settlement that can result in damage to the bridge foundations as well as the entire bridge structure.

The adaptation costs for bridge infrastructure to climate change are expected to be huge. To effectively deal with the on-going climate change, design guidelines considering the effects of climate change such as higher flood and sea level may need to be developed and implemented. The local extreme climatic events have more influence on vulnerability of the bridge so that the site specific impacts of climate change must also be considered in the design stage. The additional uncertainty that climate change brings, and the nature of these changes makes effective risk management and monitoring of bridge deterioration even more important.

- Regarding New repair and rehabilitation methods:

It appears that the most common bridge degradation problems concern reinforced and prestressed concrete bridges, and more specifically corrosion problems. Many of these problems are related to internal post-tensioning tendons. This is due to the facts that this technology has been widely used in several bridge stocks, that evidence of the beginning of degradation is difficult to observe, and that the rehabilitation methods are not easy to find and to apply.

For steel bridges, fatigue cracks have become a larger problem than originally imagined. This problematic situation is coming up in an increasing way with aging structures.

Many rehabilitation methods have been detailed in this report. Eventually it is only a partial overview limited to the 59 answers received, one can observe the followings:

- The increase of real rehabilitation methods that preserve the structures instead of replace part of them. Cathode protection is a good example.

- The frequent use in some countries of fiber reinforced polymer (FRP) plates or sheets with occasional use of post-tensioning of those elements.
- If partial replacement of concrete elements remains a necessity, the evolution in the concrete technology offers different new options as lightweight or high performance concrete, or reinforcement with fibers.

The financial aspect has also been considered for the analysis of rehabilitation methods. But, relevant information has been difficult to collect. First, the participants to the questionnaire seem not to feel able to give some precise financial information. Second, given that contracts are different from one country to another, it has been difficult to determine what are the services really included in a price and consequently to compare them.

All those information on degradation problems and rehabilitation methods are very important for bridge designers. Unfortunately, there is quite a substantial time between the construction and the appearance of a degradation process in a bridge, which delays the feedback loop of the effectiveness of a specific design. Meanwhile, information exchanges must increase between bridge designers and bridge inspectors.

Finally, facing to an ever-aging bridge stock requiring rehabilitation, bridge engineers must think out of the box and be incited to use innovative practices, on the basis of reliable assessing methods. This challenge seems to be the same all around the world.

- Regarding Risk-based management of the bridge stock:

It discusses the integration of risk management into bridge management systems from several countries as an informal or formal methodology. It shows different choices implemented in several countries. Although there is still no systematically formal methodology of risk management, 11 departments from several countries who answered the questionnaire integrate at least implicitly risk analysis in their bridge management system (monitoring, evaluation, prioritization, programming).

First, a general formal risk analysis methodology is presented. The latter is then applied to isostatic precast post-tensioned concrete girder bridges. It is finally shown an informal risk analysis, used in France and exploited in order to select the most suitable safety barrier corresponding to given criteria.

The general principle of the formal methodology consists in the examination and combination of hazards, vulnerability with respect to hazards and severity of consequences (i.e. human and economic costs).

The report compares two risk analysis methodologies; the one used by Japan and the other by France, in the field of seismic risk. As Japan is frequently impacted by extreme seismic, this country has integrated feedbacks of recent seismic events in its former methodology. These last adaptations are highlighted in the report.

Two applications of Korean formal risk analysis methodology are presented: the first one deal with fire risk and the second one aims at determining when wind barriers are necessary to ensure security of infrastructures users.

The report puts in evidence the interest of developing a risk analysis methodology adapted to the climate change.

- Regarding Estimation of load carrying capacity of bridges based on damage and deficiency:

The safety of the travelling public on road bridges is one of the main concerns for all road authorities. Therefore, it is important to identify the effective methods for the estimation of load carrying capacity of bridges based on damage and deficiency. This process starts with the bridge inspection. Based on the inspection results, additional actions such as a special inspection are decided and performed. By using the data collected during inspections, the load carrying capacity is estimated. Results from the estimation of the load carrying capacity might require the road authority to restrict the traffic on the bridge.

The report describes the current practice within this process in the different enquired countries. The main findings based on the performed research are as follows:

In the bridge inspection procedure, there are several triggers which lead to the evaluation of the load carrying capacity of a bridge. They include (1) a change in permanent load, (2) a deterioration or deficiency identified by the inspection, and (3) an emergency action. Most road authorities perform additional inspections or surveys in order to perform the estimation of the load carrying capacity of a bridge.

For the enquired road authorities, there are commonly three types of bridge inspections, including surveillance or daily patrol, routine/main/principal visual inspection, and special inspection. Most road authorities perform detailed visual inspections every 5 to 6 years. Based on the detailed visual inspection, a special inspection can be performed in order to investigate the bridge more in detail.

Many countries do not use the routine or visual inspection data to perform the evaluation of the load carrying capacity. Instead, they perform additional field surveys, in-depth inspections, and non destructive testing methods.

On the contrary, USA uses the acquired inspection data with engineering judgment in order to perform the evaluation through calculations, prior to requiring any additional inspection.

Many countries use the results of the routine or visual inspections and apply the condition indices of the members to bridge analysis models or to established evaluation equations in order to determine the load carrying capacity. Then, they may choose to do an in-depth inspection, or more detailed surveys, including non destructive testing, if the results of the analysis show insufficient capacities.

The currently applied main three traffic restriction methods are: bridge closure, limiting the number of traffic lanes, and limiting the maximum tonnage of the truck axles or of the total truck load.

All enquired countries referenced using engineering judgment to apply deterioration and damage to the load carrying capacity. Therefore, training, knowledge, efficient program management and innovations are essential to the road owners to provide safe bridges for their users.

**TECHNICAL COMMITTEE 4.4
EARTHWORKS AND UNPAVED ROADS**

2012-2015 ACTIVITY REPORT

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1. LIST OF MEMBERS

The active members who participated during the 2012-215 period and who are responsables of the final reports, seminars and organization of the related session in the world congress are listed in the ensuing.

Paul GARNICA	Mexico	President
Thierry DUBREUCQ	France	French secretary
Andrew BOSCO	Australia	English secretary
Aurea PERUCHO	Spain	Spanish secretary
Claude AIMÉ	France	Member
Guy RAOUL	France	Member
Frank THEYS	Belgium	Member
Ashaari Bin MOHAMAD	Malaysia	Member
Hind BENDIDI	Morocco	Member
David OLODO	Benin	Member
Simon PETERSON	South Africa	Member
Dirk HEYER	Germany	Member
Enrico MITTIGA	Italy	Member
Stephan BERNHARD	France	Member
Nam MOON-SEOK	South Korea	Member
A. RAKOTOBÉ	Madagascar	Member
Andrei OLTEANU	Rumania	Member

2. WORK PROGRAM

For the 2012-2015 period the reference terms defined the work issues as follows:

- Issue 4.4.1 : Optimal use of local materials
- Issue 4.4.2 : Slope and foundation drainage and storm water management
- Issue 4.4.3 : Maintenance techniques for unpaved roads in developing countries

The first issue want to complete recommendations for use of local materials, with among others the establishment of a databank of geotechnical marginal materials. Assess the risks involved with local materials used at the limit specifications, compare the specifications of various systems AASHTO, ASTM, GTR, BS, and soon the new European standard execution of earthworks and try to promote a common approach in member countries, taking into account construction under extreme conditions.

For the second issue we pretend to compare methods of drainage and water management in different countries, develop the concept of adaptability of earthworks for drainage and highlight the geotechnical aspects which are affected by climate change.

For the third issue the objectives are to review the innovation in the field of maintenance of unpaved roads (additives, stabilizers, polymers ...). Analyze the type and reliability of methods of monitoring and evaluation for unpaved roads (job control, prioritization of maintenance activities, etc.) and collect and compare the maintenance practices for dirt roads, forest roads, rural roads, among others.

The details of the work program are showed in the following tables.

Table 1. Work program of the technical Committee: 4.4 – EARTHWORKS AND UNPAVED ROADS

Issue: 4.4.1 – OPTIMAL USE OF LOCAL MATERIALS		
Description of the selected strategies	Building on the works of past cycles, update and complement the recommendations regarding the optimal use of local materials. Investigate construction methods and alternative materials with the potential to reduce the environmental impacts of earthworks.	
Working group leader	Thierry Dubreucq (France) and Guy Raoul (France)	
Cooperation within PIARC	None	
Cooperation with other organisations	None	
Outputs		Calendar
Technical reports	Updating of the report on optimal use of local materials Manual of construction methods and materials for earthworks	December 2014 December 2014
Articles for Routes/Roads	One	
PIARC international seminars	Optimal use of local materials	End of 2013
Other events	None	None
Sessions at XXV World Road Congress		2-6 November 2015

Technical Committee: 4.4 – EARTHWORKS AND UNPAVED ROADS

Issue: 4.4.2 – SLOPE AND FOUNDATION DRAINAGE AND STORM WATER MANAGEMENT		
Description of the selected strategies	Review the efficient methods and approaches with regard to slope and foundation drainage and storm water management, including the effects of climate change and the associated need for adaption.	
Working group leader	Ashaari Bin Mohamad (Malaysia)	
Cooperation within PIARC	TC 1.3 for a joint seminar organization	
Cooperation with other organisations	none	
Outputs		Calendar
Technical reports	Report on methods and approaches of slope and foundation drainage and storm water management	December 2014
Articles for Routes/Roads	One	
PIARC international seminars	Methods and approaches of slope and foundation drainage	End 2014
Other events	none	
Sessions at XXV World Road Congress		2-6 November 2015

Technical Committee: 4.4 – EARTHWORKS AND UNPAVED ROADS

Issue: 4.4.3 – MAINTENANCE TECHNIQUES FOR UNPAVED ROADS IN DEVELOPING COUNTRIES		
Description of the selected strategies	Review the progress made in maintenance techniques for unpaved roads that have been introduced by developing countries	
Working group leader	David Olodo (Benin) and Hind Bendidi (Marroc)	
Cooperation within PIARC	None	
Cooperation with other organisations	None	
Outputs		Calendar
Technical reports	Guidance report on maintenance techniques for unpaved roads in developing countries	December 2014
Articles for Routes/Roads	One	
PIARC international seminars	none	
Other events	none	
Sessions at XXV World Road Congress		2-6 November 2015

3. ACTIVITIES OF TC 4.4

3.1. Issue 4.4.1: Optimal use of local materials

The objectives of this issue were as follows:

- Complete the recommendations for the use of local materials, including the establishment of a geotechnical databank on marginal materials;
- Assess the risks involved with local materials used at their limit specifications;
- Compare the specifications of various systems AASHTO, ASTM, GTR, BS, and soon the new European standard for the execution of earthworks;
- Promote a common approach within member countries, with input from Asian countries being well represented within the current cycle. Taking into account construction under extreme conditions.

In this issue, whose leader was Mr. Thierry DUBREUCQ (France), one of the task was to improve the questionnaire from the previous session 2008-2011 with information including geotechnical data and then sent to members. It was requested that each member of the Technical Committee kindly respond to the new questionnaire, and examine what is happening in their own countries regarding innovations (see the literature, case studies) relating to the use of local materials and to then inform the Technical Committee either orally or in writing.

Discussions during the meetings allowed also to have really interesting exchanges on the issue. For example, Ms. Aurea PERUCHO presented on the techniques for optimal use of local materials in road embankments used in Spain.

The standard for the construction of roads in Spain is called the PG-3. The first version of this standard was approved in 1975. The use of marginal materials was added to the standard in 2002. PG-3 standard 1975, defined four categories of materials for embankments : selected, adequate, acceptable and inadequate.

For the classification of soils and rocks in a category, we select the following characteristics : plasticity, organic content , density, CBR value, swelling and grain size. The increasing need to utilize existing natural materials and the sustainable development policies from the 80s and 90s have introduced a new version of the classification of soils and rocks for use in road embankments. This new classification changes the previous classification criteria and defines a new type of material called "marginal material."

The new classification is based on the following characteristics: plasticity, organic content, collapse, swelling, soluble salt content, gypsum content and grain size.

In conclusion, the marginal natural materials are mainly used in the core of the embankment, sometimes in the foundations and slopes, never in the outer or final layers. A specific process is described for each use. Swelling materials are treated with a percentage of lime, of around 2% (slightly higher when used in foundations or slopes).

Gypsum materials are isolated by impermeable membranes. The best way to compact clay and gypsum materials is compactor with "foot". The middle layers are of the order of 300 mm thick. "

The survey questionnaire of this issue was sent in May 2013 to all members of the committee and 18 surveys were returned. The answers come from seven countries: Germany (1), France (9), Mali (2), Morocco (1), Senegal (1), South Korea (1) and Australia (3).

For example, from the analysis of results of the enquiry sent by Mr. Cheik Oumar Diallo (Mali) we know that Mali, consists of an area of 1,241,000 km², located between the 10th and the 25th degree of north latitude, and between the 4th degree of west longitude with a flat and slightly hilly terrain. The country has a varied climate: Sudan Guinea to the south, Sahel-Saharan in the north with the inland delta of the Niger River in the center, annual rainfall is less than 100 mm per year in the Sahara and can reach 1200 mm in the Guinean zone.

Nearly all road infrastructure is located in the south of the country. The main material used is laterite. Climatic conditions are extreme: drought in the north, downpours in the center and south. The wearing course of unpaved roads is laterite. Improvement is obtained by cement stabilization or lime stabilization by adding other crushed local materials. Substitution is a product of crushing locally extracted rock (sandstone, granite)."

From the Mr. Nam MOON (South Korea) contribution we know of exhaustion of sands used in base layer (sub-base) for pavement. In the Republic of Korea, there is a gradual depletion of natural sands used in foundation layer floor. The alternative material is the screenings by-product of crushed stone in a quarry: resulting from the process of making aggregates for mixing asphalt or cement concrete. These fine aggregates are used without any treatment. Better resistance is obtained with granites and limestones. If necessary, it prevents the risk of frost issues by incorporating a 30 percent weight range of mixed aggregates. Guides exist for the control. Additional research has been conducted to use these screenings in the base layers of concrete pavements. By using screenings, it is expected that the application of screenings to construction in the field will contribute to cost savings, material recycling and environmental benefits. The case study of Highway No. 40 (PyungTack - CHUNGJU) was presented. "

Another example of contribution was made by Mr. Thierry DUBREUCQ, who provided an overview of the French practices for the optimal use of local materials and alternative materials in road construction. He explained the process for evaluation described in the guide, use of local materials (SETRA, 2004). This involves a risk assessment on site in order to fix the properties of the existing materials and structures (full scale tests). The guide on the development of alternative materials (SETRA, 2011) was also mentioned. Finally, the database "<http://ofrir2.ifstar.fr>" French Observatory Resources for Road Infrastructure " was introduced by a few slides. This database contains records including (definition, public rules, physical-chemical characteristics, geotechnical, environmental, health aspects, etc ...) of materials such as fly ash, sludge, sediment dredging, quarry products, waste equipment for the road ... Case studies were then presented illustrating the use of sludge dredged in the Arcachon region (France), or tyre chips used in landfills. Finally a repair technique for a swelling embankment (industrial by-products) by means of a layer of polystyrene blocks was presented.

The product of this issue will be an improved version of the report on *Innovative approaches toward the use of locally available natural marginal materials* , Ref. PIARC : 2012R37.

In this issue it was also decided to develop a manual for the construction methods and use of local materials for earthworks.

The leader of this manual was Mr. Guy RAOUL (France) that proposed to adopt the definition of CEN-TC396 for earthworks, planning and design of earthworks.

Definition of earthworks

"Earthworks are a civil engineering process that includes to extract, load, transport, transform/improve, place, stabilize and compact natural materials (soils, rocks), secondary or recycled materials in order to obtain stable and durable cuttings, embankments or engineered fills. These works may be executed underwater. Earthworks require planning, design, construction and maintenance. Earthworks are characterized by the need to use available natural or recycled materials and to handle them in a way appropriate to yield prescribed properties."

Design of earthworks and earth-structures

"Earthworks are a construction process which produces earth-structures. Earth-structures are civil engineering objects, which have to fulfil stability, deformation, hydraulic or other requirements."

Mr. Guy RAOUL, helped by Mr. Claude AIME presented a detailed manual on Earthworks Plan. The following items have been added to the Manual.

1- General Considerations

2 – Earthworks Design/Project

- Ø Environment : habitat, agriculture, forestry, groundwater resources, recreation, wildlife, water, soil, heritage, landscape and secondary roads
- Ø External inputs
- Ø Specific embankments : heterogeneous, very dry materials, the right to landfill or a polluted site, aquifer zone, fill \leq 1m with the water table at ground level, base of the embankment in water
- Ø Underground Cavities
- Ø Removal of topsoil
- Ø Pavement drainage and internal drainage
- Ø Reference European standardization project

3 - Studies and initial geotechnical investigations

- Ø industrial by-products
- Ø polluted soils

4 – Methodological Process

- Ø Compacting the fill edges

5 – Technological Process

- Ø Extraction : Excavation with explosives , underwater
- Ø Transport:
- Ø Compaction
- Ø Treatment with lime or hydraulic binder

6 - Inspection and Testing

7 - Contribution to Sustainable Development

8 - Technical Specifications and Standards

9 -Terminology / Glossary

The members of TC 4.4 approved the general plan for the manual for Earthworks. This plan sets out a common vision for all countries represented on the Technical Committee. It was proposed also some important points to be considered in the manual, as develop the economic impact related to the recovery of soils associated with poor geomechanical characteristics and the necessary studies for cuts (identification and characterization of materials, classification, reuse).

This product of the Earthwork's Manual will be presented in the World Congress.

3.2. Issue 4.4.2: Slope and foundation drainage and stormwater management

In this issue the objectives were as follows:

- Compare the methods of drainage and water management in different countries, develop the concept of adaptability of earthworks for drainage ;
- Highlight the geotechnical aspects which are affected by climate change

In this issue, whose leaders were Mr. Ashaari Bin Mohamad (Malaysia) and Stephan BERNHARD (France), one of the task was to define and appropriate questionnaire on surface and internal drainage practices in roads. It was requested that each member of the Technical Committee kindly respond to the new questionnaire, and examine what is happening in their own countries regarding innovations (see the literature, case studies) relating to this issue and then inform the Technical Committee either orally or in writing.

The questions cover all types of roads (high or low traffic, sealed or unsealed, local or rural roads, suburban streets or major highways). A glossary was provided in the introduction. Surface drainage and internal drainage will be separated within the enquiry. Mr. Ashari BIN MOHAMAD will be in charge of the internal drainage and Mr. Stéphane BERNARD with pavements/surface drainage.

Discussions during the meetings allowed also to have really interesting exchanges on the issue. Mr. Jeon KYUNGSOO presented drainage systems for highways in the Republic of Korea and stormwater management. After describing the general geology and the motorway network, he presented a national risk map and defined the types of landslides encountered. Case studies are presented (Yongdong Highway, rain :109 mm/hour). Global warming seems to cause increased rainfall intensity. Mudslides and rocks on the slopes are found (solifluction). For highways, each drainage system (hydraulic culvert, surface sewerage, slope drainage, trench drainage) has a return period well defined by geography (mountains, plains, adjacent stream). A drainage class and a method of calculating the waterflow are affected taking into account the extension of the site. Typical drainage systems are then presented. To prevent solid flow (blocks, fallen trees), examples are shown. Mr. Jeon KYUNGSOO also states that there is a detailed map of risk areas for each highway. The presentation concluded with the repair of a landslide on Highway YungDong “.

Another example of exchanges in this issue was done by Enrico Mittiga that presented a state of the art on geotechnical monitoring techniques: "Technical Monitoring in geotechnical engineering case histories" in Italy.

His department based in Rome collates many historical cases. The geology of the country is relatively young. Earthquakes and landslides are common. During the last 10 years, there have been very heavy rains in winter, especially in Sardinia in 2013: 500 mm of rain per hour (!). He showed that in a land slide the evolution of a rock mass can be very fast compared to that of a soft ground. He described the possible topographical techniques, the use of inclinometers and radar techniques. He presented another case study : the site of Liguria Piemonte (North Italy). This concerns the remote monitoring of a 30 m high embankment reinforced by layers of geosynthetics. Interferometric radar measurements and inclinometer measurements are perfectly correlated.

Related to this issue we organized the International Seminar "Slope and Road Foundation Drainage and Stormwater Management", 09-13 November 2014, Kuala Lumpur (Malaysia)

This International Seminar was jointly organized, on "Greening Our Roads", by the Technical Committee 4.4 "Earthworks and Unpaved Roads", the Ministry of Works Malaysia, Public Works Department Malaysia, Malaysian Highway Authority, Construction Industry Development Board Malaysia and the Road Engineering Association of Malaysia.

The joint conference and seminar were attended by 960 delegates from 21 countries, including neighboring Asian countries, but also Benin, Egypt, Madagascar, Mexico, Morocco, and the United States.

The Honorable Minister of Works Malaysia delivered a keynote address at the Opening Ceremony, introducing a total of 46 papers presented orally in 11 technical sessions and some more papers presented at the poster sessions.

Among the technical highlights of the seminar were topics such as the use of GIS in slope management, effect of drainage design on slope stability, a successful storm water management technique, and perpetual pavement.

The occurrence of slope failures in tropical climates is linked to increased pore water pressure in the slope. Lifelong maintenance of the drainage system is crucial to ensure its integrity and functionality hence the slope's stability. A Geospatial Information System for Slope Management has enabled the Public Works Department Malaysia to identify the hazards and risks of slopes in Malaysia and prioritise slopes that need immediate attention for maintenance and remedial works.

A member of Technical Committee 4.4 presented a study on the management of runoff water from the highways. Containing leachate and accidents related spills, they have a detrimental impact on the condition of water collecting structures and underground. A filtration system has been successfully implemented in Italy and consists in a combination of treatment and emergency systems.

This seminar is one of the products in this issue. In the world congress a general report will be presented including the analysis of the answers to the inquiry.

3.3. Issue 4.4.3 : Maintenance techniques for unpaved roads in developing countries

In this issue the objectives were as follows:

- Review the innovations in the field of maintenance of unpaved roads (additives, stabilizers, polymers ...);
- Analyze the type and reliability of methods of monitoring and evaluation for unpaved roads (control of works, prioritization of maintenance activities, ...);
- Collect and compare the maintenance practices for dirt roads, forest roads, rural roads, among others; improve the design methods for unpaved roads in connection with the issues associated with No. 4.4.2.

Unfortunately, because the few members coming from developing countries, we were not able to define an appropriate inquiry, if well the exchanges during the meetings were rich in content.

Example of this was Mr. Simon PETERSON who presented the uses of soil and rock in the construction of roads in South Africa (General geological map, geological main structures, climate, soils and rocks in road construction).

More interesting was the presentation of Mr. Andrew BOSCO of an Australian guide for maintenance unpaved roads: "Guide to Pavement Technology Part 6: Unsealed Pavements, AustroadsInc..2009 ". Unpaved roads in Australia are managed by local districts. This guide aims to introduce for non-specialist manager the unpaved roads techniques, in accessible terms.

The classification of unpaved roads is based on road traffic: 5 classes are defined. The thicknesses of the layers and the respective speed limits are indicated. The guide introduces a wear layer (wearing course or sheeting layer) instead of wearing for a paved road. Recommendations on the size distributions of the different layers are enacted. Compaction rules are recalled.

A chapter is dedicated to the treatment of soil (cement and/or lime), including the principle of mixing of granular materials. Soil stabilization by chemicals or polymers is discussed. Another chapter is devoted to measuring the wear of unpaved roads by original analysis of the dust produced by traffic. A final chapter is devoted to the management of the maintenance of unpaved roads.

Life of unpaved Australian roads is about twenty years if the quality of construction materials is respected and periodic maintenance of roads met (every three months in wet weather).

Finally it was decided to treat this issue by the International Seminar "Earthworks and Pavements in Arid and Semi-arid Zones" organized from 09-10 June 2014, in Rabat (Morocco)

This International Seminar "Earthworks and Pavements in Arid and Semi-arid Zones" was jointly organized by our Technical Committee 4.4 "Earthworks and Unpaved Roads" and the Permanent Moroccan Association of Road Congresses (AMPCR).

The main topics proposed were:

Topic 1. Optimal use of local materials for road construction in arid and semi-arid zones.

Topic 2. Earthworks in arid and semi-arid zones. Specifications, design and construction.

Topic 3. Pavements in arid and semi-arid zones. Specifications, design, construction and maintenance.

Topic 4. Adaptation to climatic change of road infrastructure in arid and semi-arid zones.

This seminar was finally the product of this issue.

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