

WORLD ROAD ASSOCIATION

# PIARC ACTIVITY REPORT 2004-2007



From the

## Durban Congress

october 2003



to the

## Paris Congress

september 2007



Association  
mondiale  
de la Route



World Road  
Association

[www.piarc.org](http://www.piarc.org)



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## 1. FOREWORD



At the time of my election as President at the end of 2004, one year after the Durban Congress, I outlined five major challenges facing PIARC in the current cycle. It is timely in this 2004-2007 Activity Report to take stock of our progress in addressing these challenges.

Firstly, we have maintained the momentum in the excellent work of our nineteen Technical Committees. Their Activity Reports included in this document demonstrate the richness, variety and developing trends in today's road transport. They will contribute greatly to our ability to make improved choices for sustainable transport – the theme of this XXIII<sup>rd</sup> World Road Congress in Paris.

The work of the Technical Committees over the last four years has focused on four broad areas, corresponding to the four Strategic Themes under PIARC's Third Strategic Plan: good governance and administration, sustainable mobility, safe and efficient operations and appropriate infrastructure. As we finalise the Fourth PIARC Strategic Plan to guide our work over the next four year cycle, these four broad areas are likely to continue, but with some changes of emphasis within each of them.

Secondly, we have enhanced the effectiveness of information gathering, dissemination and exchange, in large part by increasingly embracing electronic media. The structure and format of technical reports have been strengthened and unified, and these reports are now available free on the internet. The Routes/Roads magazine has been revamped to a more attractive and readable format and the dissemination of Technical Committees' work throughout the cycle has been significantly improved through the increased delivery of seminars. There is also greater use of National Committees for gathering and disseminating information.

Thirdly, we have raised the profile of PIARC and involvement in its activities in developing countries and countries in economic transition, largely through the seminar program. Most Technical Committees have held two seminars during the last four years; most of these have been held in developing countries and countries in economic transition, and have been well received, attracting audiences from neighbouring countries as well as from the host country.

However, our experience with the first few technology transfer centres has been mixed. As a result, we are reviewing our approach to the establishment and maintenance of technology transfer centres to better ensure their usefulness and sustainability.

More generally, we have developed and are starting to implement a Communications Strategy and Action Plan for PIARC aimed, among other initiatives, at raising the profile of PIARC with both members and non-members, and particularly among younger professionals.



This relates also to our fourth challenge. We have been working on increasing membership, lifting the level of activity of current members and developing closer relationships with relevant international organisations. A number of memoranda of understanding and protocols have been agreed or are currently under consideration that will lead to improved sharing of knowledge and collaborative work. In addition, relations have been strengthened with Ibero-American countries through DIRCAIBEA, with African countries through AGEPAR and ASANRA, and with Asian countries through REAAA.

Fifthly, we have reviewed the income and expenditure of PIARC and implemented changes that have arrested a long-term, slow decline in the Association's financial resources and should ensure its ongoing financial viability.

Following the successful International Winter Road Congress in Torino and Sestrière in March 2006, this World Road Congress in Paris represents the culmination and reporting of four years of outstanding work by many hundreds of people from our 111 member countries and 36 National Committees around the world. It also celebrates the centenary of the founding of our Association at the First World Road Congress here in Paris in 1908.

It is therefore entirely fitting that this Congress will devote serious attention to the history of roads and road transport over the last hundred years and the rich heritage it has bequeathed to us. It is also fitting that the Congress will focus strongly, through its Strategic Direction and Special Sessions, on key issues and challenges facing the roads and road transport sector in the years ahead, and how this sector can best contribute to the needs of road users and their communities.

These two streams form the challenge for every single participant here at this Paris Congress. We have a century of wonderful progress, a century of achievement, a century of contribution to the betterment of humankind in a more sustainable world. We must choose wisely to ensure that we direct our future efforts in ways which also facilitate progress, achievement and a better world for countries and communities around our globe. I call upon all delegates to participate fully, listen and show respect to others and give earnestly of their ideas for a better future.

In the meantime, my thanks go to all those who, through their passion for this vision and their hard work, have contributed so much to the success of PIARC and this Centenary World Road Congress.



Colin JORDAN  
President of the World Road Association



## 2. GOALS AND ACTIVITIES CONSISTENT WITH NEEDS

### 2.1. 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. PIARC 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.

It had an initial membership of 15 countries and has developed throughout the XXth century into a real world association. Since 2003, 4 new governments have joined PIARC, which has now grown to 111 member governments and other members (regional authorities, collective members and individual members) from some 140 countries approximately.

#### The 111 Member Governments of the World Road Association (PIARC) in June 2007

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

Member governments since 2003 in **bold** type; countries having a National Committee in *blue*.



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

Although technical road matters naturally still play a significant part, PIARC also addresses economic and environmental matters, road safety, road infrastructure financing, as well as the changing organisation and roles of the Road Administrations, which are all central to current concerns of public authorities and professionals in the road and road transport sector.

The World Road Congresses--PIARC'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 fifty years, PIARC'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.

## 2.2. 2004-2007 Strategic Plan

### 2.2.1. PIARC's Mission, Values and Vision

PIARC's purpose, mission, values and vision, as identified in 1995, are still considered to be relevant.

PIARC exists to serve all its members by:

- being a leading international forum for analysis and discussion of the full spectrum of transport issues, related to roads and road transport,
- identifying, developing and disseminating best practice and giving better access to international information,
- providing within its activities special emphasis for developing countries and countries in transition,
- developing and promoting efficient tools for decision making on matters related to roads and road transport.

PIARC's values are:

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



### 2.2.2. Strategic Objectives

Just like the two previous four-year plans, the 2004-2007 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 Durban in 2003. The Strategic Plan organizes the activities of the 19 Technical Committees in four Strategic Themes:

- Theme 1: Governance and Management of the Road System
- Theme 2: Sustainable Mobility
- Theme 3: Safety and Road Operations
- Theme 4: Quality of Road Infrastructure.

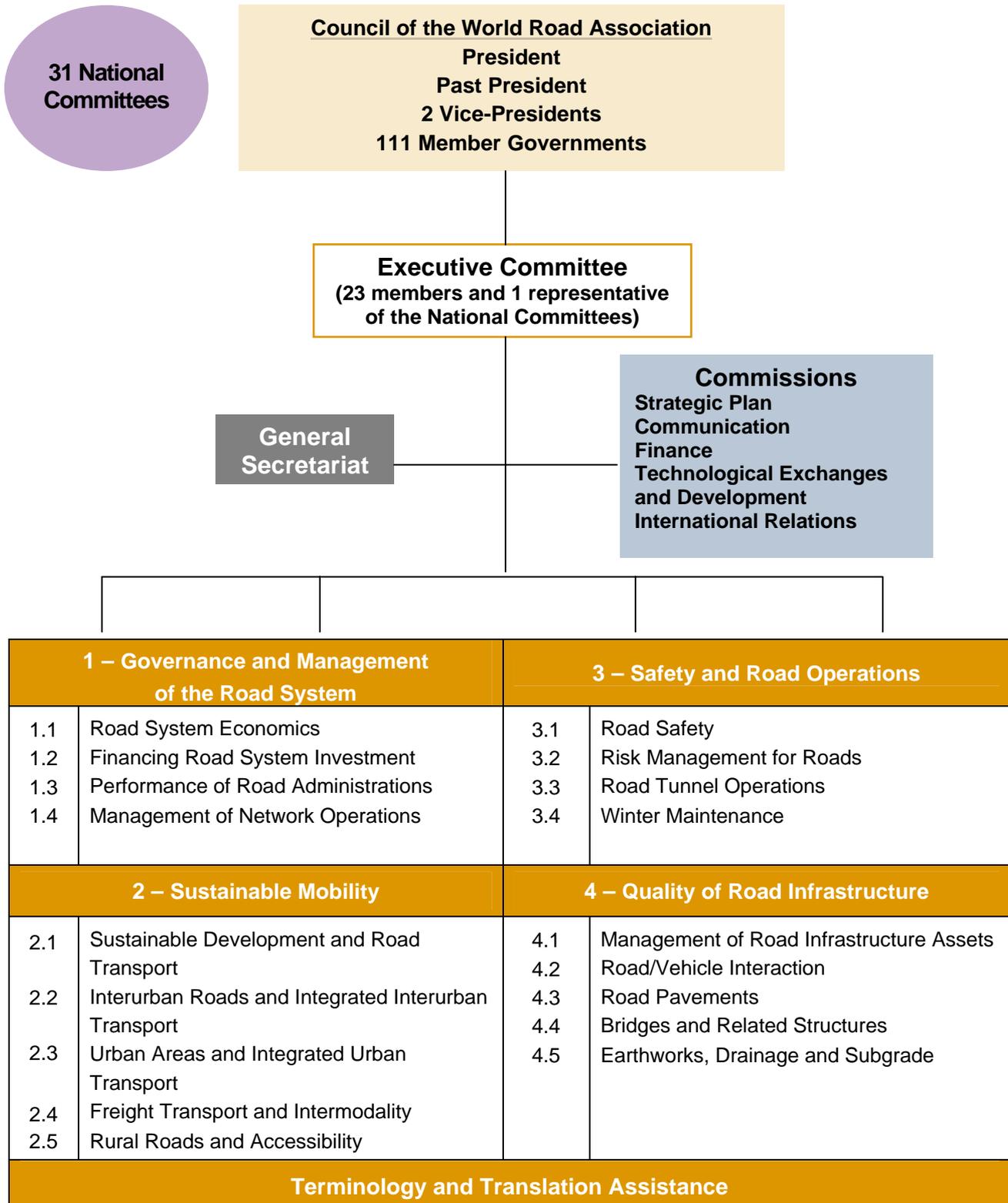
In addition to the issues assigned to the Technical Committees, the 2004-2007 Strategic Plan has also defined a series of organisational goals to help PIARC fulfil its mission. These goals, listed below, have been translated into strategies for action:

- A. To provide and enhance international networks and forums to help members exchange information and world best practice;
- B. To develop and encourage professionally worthwhile and effective personal contact networks;
- C. To develop practical means for efficient and effective technology transfer among countries;
- D. To run Congresses that are major and valuable events for information exchange among members of the road transport community, and to run them so that they are viable from PIARC's point of view;
- E. To produce and disseminate authoritative, impartial and interesting publications that address current road and road transport issues;
- F. 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 PIARC Technical Committees;
- G. To improve continuously the management and operation of PIARC in order to provide members with a service that represents good value for money;
- H. To promote cooperation with other international and regional groupings with related goals.



### 3. PIARC'S STRUCTURE

PIARC's operation structure reflects the orientations of the Strategic Plan.





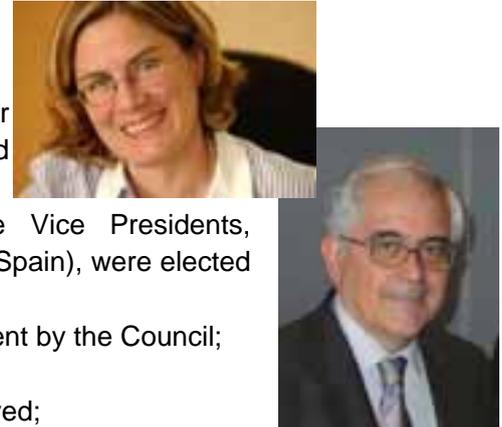
### 3.1. Council of the World Road Association

The Council has overall responsibility for PIARC administration. It meets once a year and is composed of member government delegations each led by a First Delegate.

Over the 2004-2007 period, the Council held the following meetings and made the following decisions:

#### Montpellier, 29 september 2004

- Colin Jordan (Australia) was elected PIARC President for the 2005-2008 period, succeeding Olivier Michaud (Switzerland);
- the members of the Executive Committee and the Vice Presidents, Anne-Marie Leclerc (Canada-Quebec), Francisco Criado (Spain), were elected for the 2005-2008 period;
- Dr. Hiroshi Mitani (Japan) was appointed Honorary President by the Council;
- the new Strategic Plan 2004-2007 was approved;
- the membership of Azerbaijan and El Salvador was approved;
- the dates of the 23<sup>rd</sup> World Road Congress (Paris) were set: from 17 to 21 September.



#### Beijing, 12-13 october 2005

- Quebec City (Canada-Quebec) was selected to host the 13<sup>th</sup> International Winter Road Congress in 2010;
- Measures were adopted to restore financial balance, combining control of expenses, use of part of income from Congresses and increase of membership fees,
- PIARC technical reports are available free to the public from the PIARC website,
- the project to digitalize proceedings of PIARC World Road Congresses since 1908 was initiated on the occasion of the Centenary World Congress in 2007.



#### Madrid, 22-23 november 2006

- four new Executive Committee Members were elected;
- the membership of the Dominican Republic and Burundi were approved;
- the Dictionaries and Lexicon in the Terminology section of the PIARC website are made available free to the public.





### 3.2. Executive Committee

The Executive Committee meets at least twice a year and is in charge of supervising management of the Association. As of 1 January 2005, the Executive Committee Members have been as follows:



<b>President</b>	Mr. Colin JORDAN	Australia
<b>Past President</b>	Mr. Olivier MICHAUD	Switzerland
<b>Honorary Presidents</b>	Mr. Enrique BALAGUER	Spain
	Mr. Victor MAHBUB	Mexico
	Mr. Hiroshi MITANI	Japan
<b>Honorary Vice President</b>	Mr. Robert DE PAEPE	Belgium
	Ms Anne-Marie LECLERC	Canada-Quebec
<b>Vice Presidents</b>	Mr. Francisco CRIADO	Spain
	Mr. Nazir ALLI	South Africa
<b>Members</b>	<i>Mr. David ANDERSON</i>	<i>Australia (up to 2006)</i>
	Ms Ginny CLARKE	United Kingdom
	Mr. Dong-chang DAI	China (People's Rep.) (since 2007)
	Mr. Oscar DE BUEN	Mexico
	Mr. Mario FERNANDEZ	Chile
	Mr. Riccardo FORMICA	Italy
	Mr. Wolfgang HAHN	Germany
	Mr. Menno HENNEVELD	<i>Australia (since nov. 2006)</i>
	Mr. Keiichi INOUE	Japan
	Mr. Jukka HIRVELÄ	Finland/NVF (since 2007)
	<i>Mr. Eero KARJALUOTO</i>	<i>Finland/NVF (up to 2006)</i>
	Mr. Jean-Mathieu MBAUCAUD	Republic of the Congo
	<i>Mr. Charles NOTTINGHAM</i>	<i>United States (up to 2006)</i>
	Mr. Têlé David OLODO	Benin
	Mr. Julio César ORTIZ	Argentina
	Mr. Dato RAZALI	Malaysia (since 2007)
	Mr. Gheorghe LUCACI	Romania
	Mr. Carlo MARIOTTA	Switzerland
	Mr. Patrice PARISÉ	France
	Mr. Peter PENGAL	Slovenia
	Mr. Claude VAN ROOTEN	Belgium
	<i>Dato' Ir. HJ. ZAINI</i>	<i>Malaysia (up to 2006)</i>
	<b>National Committee Representative</b>	Mr. Friedrich ZOTTER
<b>Secretary General</b>	Mr. Jean-François CORTÉ	France

The Executive Committee has held the following meetings:

- 2004 Turin (Italy), 26-27 February -- Montpellier (France), 28 September
- 2005 Santiago (Chile), 29-30 March – Beijing (China, People's Rep.), 11 October
- 2006 Turin (Italy), 31 March – Madrid (Spain), 21 November
- 2007 Vienna (Austria), 8 May – Paris (France), 14 September.



In addition, a meeting was held in March 2007 in Cotonou (Benin) with a delegation of the Executive Committee and representatives of Western African road administrations to provide input to the Strategic Plan 2008-2011.



The most important subjects addressed at these meetings were as follows:

- setting up the Technical Committees (TC) for the 2004-2005 period, finalising the terms of reference, appointing the chairs and Secretaries (English speaking, French speaking and Spanish speaking),
- activity guidance and monitoring by Themes and Committees within the Strategic Plan,
- approving the technical programmes; approving the registration fee charges to the Congresses; reviewing the protocol of agreement of the Congresses,
- preparing questions to be submitted for the Council's approval; monitoring the implementation of Council decisions;
- monitoring projects financed out of the Association Fund.

### 3.3. Commissions

Five Commissions assist the Executive Committee in its tasks:

1. Finance Commission,
2. Communication Commission,
3. Strategic Planning Commission,
4. Technological Exchanges and Development Commission,
5. Commission on International Relations.

#### 3.3.1. Finance Commission

The Commission, chaired since 2005 by Mr Carlo Mariotta (Switzerland), prepares all questions with the General Secretariat connected with the use of the Association Funds in order to submit them to the Executive Committee. Over this period the Commission has specifically reviewed:

- the financial situation of the Association over the 1994-2004 period, resulting in proposed measures to restore budgetary balance that were approved by the Council in 2005;
- the consultation process, and then the preparation of the concession contract for the HDM-4 software series, Version 2, that the General Secretariat has signed with the HDM Global consortium in 2005.



#### 3.3.2. Communication Commission

During this period, the Communication Commission, chaired by Mr. Claude Van Rooten since 2005, has developed an action plan in response to the goals of the Strategic Plan. Together with the General Secretariat, the Commission has achieved the following:

- develop a note setting out the communication policy of the Association that was approved by the Council in November 2006,
- examine the development and implementation of a new graphic design charter to harmonize the image of the various communication media of the Association;





- make recommendations to improve the reports produced by the Technical Committees, from the point of view of the contents and of the graphic design used for the 2004-2007 cycle,
- review the expectations and needs of local authorities with regard to the Association,
- review the evolutions of the Association's website,
- review the project to create a virtual library for the dissemination of all publications on the website,
- prepare the PIARC Prize Competition 2007.

### PIARC Prize Competition 2007

The competition, which aims to enhance the road sector and promote PIARC's action, has given rise to many proposals.

After the first selection by member countries at the national level, 36 essays from 14 countries were submitted to the international jury chaired by Claude Van Rooten, and composed of J.-F. Corté (PIARC), and a representative of each country sponsoring one of the Prizes: Bill Frith (Australia/New Zealand), Tim Lonneux (Belgium), Catherine Berthod (Canada-Québec), Hubert Peigné (France), Tadayuki Tazaki (Japan), Gheorghe Lucaci (Romania), John Smart (United Kingdom) and Jean Bauverd (Switzerland).

These essays are entered for one of the following seven prizes: construction, maintenance and operation of roads; road safety; sustainable development; communication; 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 Paris Congress.

### 3.3.3. Strategic Planning Commission

The role of the Strategic Planning Commission, chaired since 2005 by Ginny Clarke (United Kingdom), is to monitor the implementation of this plan and revise it with a view to planning the new work cycle.

The Commission membership includes the Strategic Theme Coordinators, chosen from among the Executive Committee Members. Their role is to provide guidance and support to the Technical Committees associated with their theme and to ensure that all work in a given area has been carried out according to the goals approved in the Strategic Plan.



For the 2004-2007 period, the Coordinators were as follows:

<b>1. Governance and Management of Road System</b>	M. Keiichi INOUE	Japan	
<b>2. Sustainable Mobility</b>	Mr. Wolfgang HAHN	Germany	Ms Ginny CLARKE (United Kingdom) until 2005
<b>3. Safety and Road Operations</b>	Mr. Joe TOOLE (interim)	United States	Mr. Charles NOTTINGHAM (United States) until 2006
<b>4. Quality of Road Infrastructure</b>	Ms Anne-Marie LECLERC	Canada-Quebec	



During the present period, the Strategic Planning Commission has mainly addressed the following actions with the help of the General Secretariat:

- drafting of the final version of the 2004-2007 Strategic Plan,
- setting up the nineteen Technical Committees within the four Strategic Themes,
- approving the work programmes of the Technical Committees,
- monitoring the activity and productions of Technical Committees,
- approval of the technical program of the XII<sup>th</sup> International Winter Road Congress and of the XXIII<sup>rd</sup> World Road Congress,
- implementing the consultation process for the revision of the Strategic Plan in view of the preparation of the new plan for 2008-2011.

### 3.3.4. Commission on Technological Exchanges and Development

The Commission on Technological Exchanges and Development, chaired by Oscar de Buen (Mexico) since 2005, is in charge of the Association's strategy in the area of technological exchanges and development. The Commission has achieved the following:



- oversee the management of the programme of PIARC international seminars,
- review PIARC's action regarding the Technology Transfer Centres (TTC) project,
- oversee the use of the PIARC Special Fund by representatives from developing countries,
- studied other relevant issues such as: professional training, sustainable road infrastructure financing capacity, institutional capacity building, governance and corruption issues, and non-motorised road transport. As regards professional training, a Directory of Training Courses in the field of roads has been developed; it will be introduced on the PIARC website on the occasion of the Paris Congress.

### 3.3.5. Commission on International Relations

The Commission, chaired by Olivier Michaud (Sitzerland), has three main goals:

- increase membership,
- lift the level of activity and involvement of current members,
- develop closer relationships with relevant international organizations.



During the 2004-2007 work cycle, the priority actions have been to strengthen links with Latin American countries and with regional road organizations and administrations. The results of these actions are reported in section 4.5 - Cooperation.



### 3.4. National Committees

PIARC encourages the creation of National Committees to represent PIARC at national level, widen its audience and involvement in PIARC activities and disseminate results and recommendations more widely.



Since 2004, 6 new National Committees have been set up in Benin, Cameroon, Republic of the Congo, Mali, Mexico, and Senegal. However, the National Committee of the Netherlands has stopped its activities. In 2007 PIARC has relays in 36 countries.

The National Committee Chairs and Secretaries have met once a year on the occasion of the Council meeting, under the Chair of Mr. F. Zotter (Austria), who is the representative of National Committees on the Executive Committee. In addition, a series of regional meetings have taken place with the participation of F. Zotter, with the aim to foster exchanges of experience among countries and contribute to the dynamism of National Committees.

At national level, the National Committees have organised various meetings such as one-day study sessions and seminars under their sole responsibility or in liaison with the PIARC Technical Committees, National Road Administrations or other organisations.

To raise the profile of National Committees and share their experience, a quarterly National Committees Newsletter was created in 2005. Each issue is prepared by the National Committees under the leadership of F. Zotter, and published in English, French and Spanish. The page design of the Newsletter and the dissemination on the website is carried out by the General Secretariat. Nine issues have been produced from 2005 to September 2007.



National Committees participate in the exhibition of the XXIIIrd World Road Congress in 2007.

### 3.5. PIARC General Secretariat

The PIARC General Secretariat team comprises salaried administrative staff of the Association and executives seconded to the Association by several member countries.

For the 2004-2007 period, France has accordingly renewed its support for the offices of Secretary General and Deputy Secretary General of PIARC:

- Jean-François Corté, Secretary General, as from 2002,
- Gilbert Batac, Deputy Secretary General, from 2000 to 2005,
- Franck Charmaison (*picture*), Deputy Secretary General, since 2006.

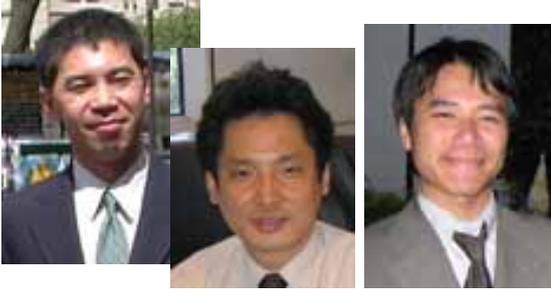


Japan, the Nordic Road Association (NVF), Austroads (Australia/New Zealand), and Spain have renewed the secondment of Technical Advisers:



**Japan**

*Hitoshi Sakuma, 2002-2004*  
*Takehiko Hatsuku, 2004-2006*  
*Masamitsu Waga, since 2006*



**Australia/New Zealand (Austroads)**

*Tegan Mitchell (Australia), Jan-Oct. 2004*  
*Philip Tweddell (Australia), Oct.2004-July 2005*  
*Amy Hall (Australia), July 2005-April 2006*  
*Kevin Locke (New Zealand), April 2006-January 2007*  
*Pierre Castelino (Australia), since January 2007*



**Nordic Road Association (NRA)**

*Marit Due Langaas (Norway), 2003-2004*  
*George Racutanu (Sweden), 2004-2005*  
*Pasi Patrikainen (Finland), 2005-2006*  
*Arve Kirkevold (Norway), since August 2006*



**Espagne**

*Joseba Echave, 2003-sept. 2004*  
*Francisco Cabeza, sept. 2004-sept.2005*  
*Miguel Caso-Florez, since September 2005.*



Since 2007, Côte d'Ivoire also brings support to the General Secretariat through the secondment of a Technical Adviser, Toussaint Aguy.



In 2007, the salaried staff are as follows:

- Véronique Anselin, Director's Assistant, since 1985
- Marie Pastol, Translator/Interpreter, since 1991
- Roger Apharel, Accountant, since 1995
- Nathalie Sabbah, Assistant, since 1995
- Cécile Aourousseau, Publications Assistant, since 1997
- Céline Le Graciet, Publications Advisor, since 2004,
- Latifa El-Ayache, Assistant, since 2006.

*(Pictures on page 31)*



## 4. PIARC'S ACTIVITIES IN 2004-2007

### 4.1. Technical Committees

Nineteen Technical Committees have been formed and organised around the four Strategic Themes to address questions adopted by the Strategic Plan 2004-2007. Approximately 1000 experts and decision-makers from nearly 60 countries and various international organisations have participated in the work of the Committees.

Each Committee has met about twice a year to accomplish the Work Programme adopted in 2004. These meetings have sometimes been coupled with one-day study sessions, conferences or congresses, which has made it possible to hold a greater number of discussions outside the circle of the Committee and to ensure better dissemination of the work.

The Technical Committees have been the backbone of the seminar programme decided by PIARC for developing countries and countries in transition, for which further information is given in 4.1.1.

This section will be limited to an outline of the goals and terms of reference of the themes. Detailed information on the activities of each Committee and their outputs over this period is given in the specific activity reports included in this report after the General Activity Report.

#### 4.1.1. Theme 1 - Governance and Management of the Road System

The aim of this theme is to improve the governance and management of road administrations in the provision of road systems in accordance with international practice.

This theme covers the activity of Technical Committees C1.1-Road System Economics, C1.2-Financing Road System Investment, C1.3-Performance of Road Administrations, and C1.4-Management of Network Operations.

These Technical Committees were expected to work on the following issues:

- road system economics within an integrated transport system, effects of road pricing on the socio-economy and project evaluation framework,
- effective management measures in both developed and developing countries that support sustainable development, such as financial procurement strategies, cost management for long-term investments and the role played by road administrations in public/private partnerships,
- measures to achieve more efficient management through the investigation of the governance and structure of road administrations, development of human resources skills, and development and application of performance indicators of road administrations,
- new ideas for network-wide management and operations, with an emphasis on customers in the provision of services, information management and the public interest, and appropriate use of information technology (ITS) for an integrated transport system.



**Committee C1.1 - Road System Economics**

Chair: Fabien Leurent (France)  
French-speaking Secretary: Maxime Jebali (France)  
English-speaking Secretary: Ian Melson (New Zealand)  
Spanish-speaking Secretary: Juan José Orozco (Mexico)

**Committee C1.2 – Financing Road System Investment**

Chair: Ms. Sherry Alston (United States)  
French-speaking Secretary: Francesco Gaeta (France)  
English-speaking Secretary: Curtis Berthelot (Canada)  
Spanish-speaking Secretary: Geraldo Gavilanes (Spain)

**Committee C1.3 - Performance of road administrations**

Chair: Paul Van Der Kroon (the Netherlands)  
French-speaking Secretary: Odile Grisaud, then Antoine Averseng (France)  
English-speaking Secretary: Martin Fletcher (New Zealand)

**Committee C1.4 – Management of Network Operations**

Chair: John Miles (United Kingdom)  
French-speaking Secretary: Jean-François Janin (France)  
English-speaking Secretary: Ralph Jones, then Debbie De Grasse (Canada).

**4.1.2. Theme 2 - Sustainable Mobility**

The aim of this theme is to encourage the development of road transport policies and programmes that result in beneficial community outcomes for sustainable and safe mobility in economic, environmental and social terms, and take full account of the need for integration with other transport modes.

This theme covers the activities of Technical Committees C2.1-Sustainable Development and Road Transport, C2.2-Interurban Roads and Integrated Interurban Transport, C2.3-Urban Areas and Integrated Urban Transport, C2.4-Freight Transport and Intermodality, C2.5-Rural Roads and Accessibility. The issues addressed are as follows:

- concrete application of policies to road transport such as those recommended by the Rio Conference and the Kyoto Protocol; funding levels to ensure environmental mitigation; mitigation of environmental impacts of road transport;
- sustainable road transport as a factor in economic and social development; interaction between the development of road and integrated transport and regional and land use planning at the regional level; integration and interoperability of different transport modes in the interurban network to support sustainable mobility;
- urban congestion; mega cities and transport systems; non-motorised mobility;
- the response of road administrations to the development of freight logistics over time and the increase in road freight transport within countries and across countries; accommodation of the increase in freight movements on road networks and the wider transport infrastructure;
- accessibility of rural areas and sustainable management of rural roads.



**Committee C2.1 – Sustainable Development and Road Transport**

Chair: Anders Jansson (Finland/NVF)

French-speaking Secretary: Jean-François Langumier (France)

English-speaking Secretary: Simon Price (United Kingdom)

**Committee C2.2 – Interurban Roads and Integrated Interurban Transport**

Chair: Jean-Michel Gambard (France)

French-speaking Secretary: Gérard Vuillemin (France)

English-speaking Secretary: Amund Bolstad (Norway)

Spanish-speaking Secretary: Juan Carlos Espinosa (Mexico)

**Committee C2.3 – Urban Areas and Integrated Urban Transport**

Chair: Csaba Koren (Hungary)

French-speaking Secretary: Christian Mauroit (Belgium)

English-speaking Secretary: Raj Ghaman (United States)

**Committee C2.4 – Freight Transport and Intermodality**

Chair: Eiichi Taniguchi (Japan)

French-speaking Secretary: Jean-Charles Poutchy-Tixier (France)

English-speaking Secretary: Yoshikazu Imanishi (Japan)

**Committee C2.5 – Rural Roads and Accessibility**

Interim Chair: Jean-François Corté (PIARC Secretary General), replacing Keso Msita (Tanzania)

French-speaking Secretary: Abdennebi Rmili (Morocco)

English-speaking Secretary: Robert Petts (United Kingdom) – *Until end 2006.*

**4.1.3. Theme 3 - Safety and Road Operations**

The aim of this theme is to improve the safe and efficient use of the road system, including the movement of people and goods on the road network, while effectively managing the risks associated with road transport operations and the natural environment.

This theme covers the activities of Technical Committees C3.1 - Road Safety; C3.2 - Risk Management for Roads; C3.3 - Road Tunnel Operations; C3.4 - Winter Maintenance. They have covered the following issues:

- make cost-effective road safety investments; improve road design concepts in relation to road safety; take advantage of intelligent vehicles and infrastructure technologies to improve road safety; take into consideration human behaviour;
- introduce risk management techniques in the road sector; introduce risk management for mega-projects; improve security;
- provide safer tunnels; improve tunnel operation and maintenance; ventilation and fire suppression; take into consideration human factors for tunnel safety;
- improve winter maintenance and operation information systems; provide sustainable winter maintenance; share knowledge.



**Committee C3.1 – Road Safety**

Chair: Hans-Joachim Vollpracht (Germany)  
French-speaking Secretary: Patrick Mallejacq (France)  
English-speaking Secretary: Ms Beth Alicandri (United States)  
Spanish-speaking Secretary: Roberto Llamas (Spain)

**Committee C3.2 - Risk Management for Roads**

Chair: Michio Okahara (Japan)  
French-speaking Secretary: Ms Line Tremblay (Canada-Quebec)  
English-speaking Secretary: Hiroyuki Nakajima (Japan)  
Spanish-speaking Secretary: Federico Fernandez (Spain)

**Committee C3.3 - Road Tunnel Operations**

Chair: Didier Lacroix (France)  
French-speaking Secretary: Pierre Schmitz (Belgium)  
English-speaking Secretary: Alan West (United Kingdom)  
Spanish-speaking Secretary: Manuel Romana (Spain)

**Committee 3.4 – Winter Maintenance**

Chair: Ms Gudrun Öberg (Sweden)  
French-speaking Secretary: Didier Giloppé (France)  
English-speaking Secretary: Paul Delannoy (Canada)

**4.1.4. Theme 4 - Quality of road infrastructure**

The aim of this theme is to improve the quality of road infrastructure through effective management of road infrastructure assets in accordance with user expectations and managers' requests.

This theme covers the activities of Committees C4.1 – Management of Road Infrastructure Assets; C4.2-Road/Vehicle Interaction; C4.3-Road Pavements; C4.4 – Road Bridges and Related Structures; C4.5 - Earthworks, Drainage and Subgrade. They have covered the following issues:

- promoting asset management methods; providing integration of condition indicators for road assets as a whole; taking into account expectations of users and residents;
- having a 20 to 30-year vision of developments in vehicle and road pavement characteristics; reducing road noise; improving the description of pavement surface characteristics;
- selecting adequate pavement types and road techniques; maintaining pavements in a sustainable development perspective; minimising the impact of road works on the areas traversed;
- increasing the durability and safety of structures; evaluating the condition of structures in connection with asset management methods; taking into account environmental and cultural aspects;
- promoting optimal use of local materials; having indicators representative of the condition of geotechnical structures for road asset management; anticipating the impact of climate changes.



**Committee C4.1 - Management of Road Infrastructure Assets**

Chair: Claude Morzier (Switzerland)  
French-speaking Secretary: Ms Ghislaine Baillemonet (France)  
English-speaking Secretary: Tadayuki Tazaki (Japan)  
Spanish-speaking Secretary: Oscar Gutierrez (Spain)

**Committee C4.2 - Road/Vehicle Interaction**

Chair: Bjarne Schmidt (Denmark / NVF)  
French-speaking Secretary: Mathieu Grondin (Canada-Quebec)  
English-speaking Secretary: Guy Descornet (Belgium)  
Spanish-speaking Secretary: Ms Marta Alonso (Spain)

**Committee C4.3 - Road Pavements**

Chair: Nelson Rioux (Canada-Quebec)  
French-speaking Secretary: Jean Crochet (Belgium)  
English-speaking Secretary: Alan Bell (Australia)  
Spanish-speaking Secretary: José Ortiz Garcia (United Kingdom)

**Committee C4.4 - Road Bridges and Related Structures**

Chair: Rafael Astudillo (Spain)  
French-speaking Secretary: Florent Imbert (France)  
English-speaking Secretary: Dimitrios Konstantinidis (Greece)  
Spanish-speaking Secretary: Ms Carmen Picon (Spain)

**Committee C4.5 - Earthworks, Drainage and Subgrade**

Chair: Giorgio Peroni (Italy)  
French-speaking Secretary: Hervé Havard (France)  
English-speaking Secretary: Martin Samson (Canada)  
Spanish-speaking Secretary: Paul Garnica (Mexico).

**4.1.5. Committee on Terminology and Translation Assistance**

The goals of the Committee on Terminology and Translation Assistance are to:

- update PIARC dictionaries,
- encourage the creation of translation memory bases,
- adjust translation softwares to the road field.

Chair: Patrice Retour (France)  
French-speaking Secretary: Ms Sylvie Proeschel (France)  
English-speaking Secretary: David Powell (United Kingdom)  
Spanish-speaking Secretary: Ms Christina Higuera (Spain).



## 4.2. Communication

The Association disseminates its activities and productions through various media, whose content, format and circulation method are designed in a complementary way:

- website: [www.piarc.org](http://www.piarc.org);
- electronic newsletter;
- “Routes/Roads”, the quarterly printed magazine,
- technical reports produced by the Technical Committees.

*The Activity Reports prepared by the various Technical Committees are contained in this report; they provide detailed information on the productions of this work cycle.*

In addition, the World Road Congresses, the International Winter Road Congresses and the PIARC International Seminars are events enabling to raise the profile of the Association, in the form of exchange of experiences. The presentations made on the occasion of those events are made available online on the PIARC website.

### 4.2.1. The website

The website [www.piarc.org](http://www.piarc.org) is the main external and internal communication tool for the organization. It is increasingly becoming a work tool for the Technical Committees and the various bodies of PIARC. Since the implementation of the new Strategic Plan in 2004, the various groups within the organization have had their own work space.



The number of visitors of the website is increasing steadily. The monthly statistics from September 2004 and March 2007 are as follows:

- the number of visitors has been multiplied by 3.7, from 3134 to 11 800;
- the number of visits has increased from 5 233 to 16 716;
- the number of pages viewed has doubled: from 26 044 to 50 358, as well as the number of «hits», from 256 777 to 510 836;
- the bandwidth has increased from less than 1 GB to 7.9 GB.

The major developments brought to the website since 2003 are the following:

- introduction of the Terminology online application that includes 8 specialized dictionaries and lexicons, including the PIARC Technical Dictionary of Road Terms available in 12 languages; this tool has been available free of charge to the public since the end of 2006;
- restructuring of the publications section with the creation of the Virtual Library; this enables consultation and the download of reports produced by the Technical Committees, and articles from the *Routes/Roads* magazine.

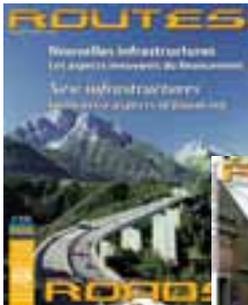
The discussions on the future developments of the website are led by the General Secretariat, together with the Communications Commission.



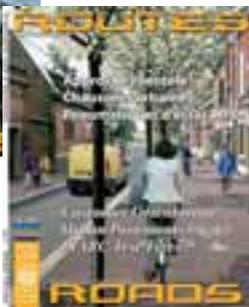
#### 4.2.2. The electronic newsletter

PIARC’s newsletter was created in 2005 and is released every 2 or 3 months. It is aimed at publicizing the events organized by the Association, the release of new publications, etc. It is also used to disseminate the letter of National Committees. In 2007, the PIARC electronic newsletter was circulated to 4 300 persons.

#### 4.2.3. The Routes/Roads magazine



The quarterly “Routes/Roads” magazine is the printed communication media of the Association. It complements the information and the results disseminated by the website [www.piarc.org](http://www.piarc.org) and the electronic newsletter.



Since the January 2005 issue, this bilingual English-French magazine is published with a new format and content (circulation: 5700 copies). In addition to feature articles, each issue includes a number of short articles on topical issues from member countries. This new content was well received by the readers.

#### 4.2.4. PIARC reports

After the Durban Congress in October 2003, the General Secretariat published 28 technical reports from the 2000-2003 cycle. Over that period, 43 reports in total were produced by the Technical Committees.



In 2004, a partnership contract was signed by the General Secretariat with the Route2Market publishing agency to publish and distribute the Road Safety Manual (English and French version) and the 2<sup>nd</sup> edition of the ITS Handbook in English. The French version of the ITS Handbook was produced by the General Secretariat in 2006, who also ensures its distribution. These two books are reference documents at the international level and are unequalled in their area.



Another major document—published on CD Rom—is the Quantitative Risk Assessment Model (QRA model) to evaluate the risks of dangerous goods transport through road tunnels. The model results from the ERS2 project developed jointly by PIARC and OECD.





On the occasion of the 12<sup>th</sup> International Winter Road Congress in Turin in 2006, the second edition of the Snow and Ice Data Book was produced by Technical Committee 3.4-Winter Maintenance. It compiles winter road maintenance best practice in member countries.

In 2005 a new graphic design was implemented for the publication of technical reports. Moreover, the Council, at its meeting in Beijing in 2005, adopted the resolution allowing free access through the website to the electronic files of all technical reports (PDF format), with a few exceptions.



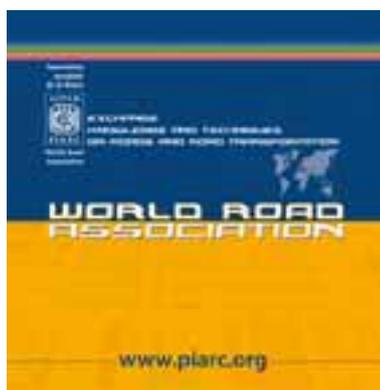
Since April 2006, the technical reports and the Routes/Roads magazine are available free to the public from the Virtual Library of the PIARC website <http://publications.piarc.org/fr/>.



It is equipped with a powerful search engine that enables to make a search directly into all the documents contained in the Library (in June 2007, the documents online included 150 technical reports and 120 articles).

For the 2004-2007 work cycle, 22 reports are expected to be produced by the Technical Committees. In 2007, the first technical reports of the current work cycle have been published according to the new format.

#### 4.2.5. PIARC brochure



To enhance the image of the Association, a new presentation brochure has been produced by the General Secretariat with the new graphics used for the magazine and the website.



The text and illustrations files have been provided to the National Committees to enable them to produce a brochure in their national language and include a section on their National Committee.



### 4.3. Congresses

#### 4.3.1. PIARC World Road Congress

The aim of the World Road Congresses is to bring together decision-makers and experts from all over the world in the field of roads and road transport to present and discuss recent experiences and recommendations. The World Congresses are held every four years. The previous one, the 22<sup>nd</sup> World Congress, was hosted in Durban (South Africa) in 2003.



The Durban Congress and the related exhibition drew nearly 3500 participants from 108 countries, and 47 countries were represented at ministerial level. The Congress proceedings were published on CD-Rom and circulated in 2005.

For the XXIIIrd World Road Congress in Paris (France), from 17 to 21 September 2007, the first announcement was released in January 2006 and the second one was circulated in January 2007.



Besides the four “Strategic Direction” sessions organised by the Theme Coordinators, and the 18 sessions of the Technical Committees, the Congress programme comprises 20 special sessions organised by PIARC in conjunction with other international organisations.

The official languages for the Paris Congress will be English, French and Spanish.

#### 4.3.2. PIARC International Winter Road Congress

The XII<sup>th</sup> Congress, organised by Italy, was held in March 2006 in Turin-Sestriere on the general theme “Keeping the users on the move in winter”. It drew the participation of 1500 delegates from 44 countries. For the first time in the history of International Winter Road Congresses, a plenary ministerial session was organized, involving 12 delegations.

The following topics were on the technical programme:

- strategies, levels of service and standards,
- performance and financing,
- safety and mobility in winter, social aspects,
- the environment,
- winter maintenance management systems,
- snow and ice removal technology.





The call for papers met with great success, with 120 papers selected. The congress proceedings were published in a CD-ROM in 2007 by the Italian Organizing Committee, with the assistance of the General Secretariat.

The XIIIth International Winter Road Congress will take place in Quebec City (Canada-Quebec), from 8 to 12 February 2010.

## 4.4. Association projects

To carry out its missions, particularly those concerning knowledge, competence and technology transfer, and the participation of developing countries and countries in transition, the Association has further implemented the resolutions adopted by the Council in 1999 to make funding possible out of the Association Fund for various projects.

### 4.4.1. Seminars

To better identify the needs of developing countries and countries in transition, to facilitate exchanges and knowledge transfer involving more participants from these countries, international seminars at regional level were organized, notably in these countries. The ambition was that each Technical Committee should participate in the organization of 2 seminars.

This aim was not fully achieved, but 22 seminars were organised in 19 countries, with the help of 15 Technical Committees, as shown by the following table.

COMMITTEE	DATE	TOPIC OF THE SEMINAR	HOST COUNTRY
C1.1 / C1.2	April 2005	Road pricing, financing, regulation and equity	MEXICO
C2.4	June 2005	Freight transport and intermodality in Western African countries	BURKINA FASO
C3.4	September 2005	Safe and efficient winter maintenance practices	LATVIA
C4.3	September 2005	Urban pavements	POLAND
C1.3	October 2005	Good governance, institutional integrity and human resources management	POLAND
C3.1	October 2005	Road safety	CHINA (PR)
C2.5	November 2005	Sustainable access and local resource solutions	CAMBODIA
C4.2	February 2006	Monitoring and managing paved and unpaved roads	MALI
C3.3	March 2006	Safety and operation of road tunnels	ARGENTINA
C2.5	April 2006	Maintenance of rural roads – Stakes and perspectives	MOROCCO
C3.2	April 2006	Risk management for roads	VIETNAM



<b>C2.1 / C2.2</b>	May 2006	Sustainable development and road transport – Interurban roads and integrated interurban transport	MEXICO
<b>C1.4</b>	August 2006	Intelligent transport systems in road network operations	MALAYSIA
<b>C2.4</b>	September 2006	Freight transport in landlocked developing and in transition countries	MONGOLIA
<b>C3.1</b>	October 2006	Improving the safety of road infrastructures	TOGO
<b>C3.3</b>	October 2006	Road tunnel operations management and safety	CHINA (PR)
<b>C1.3</b>	March 2007	Performance of road and road transport administrations: institutional capacity building, human resources management, good governance	BENIN
<b>C1.2</b>	April 2007	Sustainable road financing and investment	TANZANIA
<b>C1.4 / C3.1</b>	April 2007	Road network operation management and road safety	CHILE
<b>C4.3</b>	April 2007	Road pavement management	CUBA
<b>C4.3</b>	April 2007	Use of cement for pavement rehabilitation	GUATEMALA
<b>C4.5</b>	June 2007	Adapting road earthworks to the local environment	ROMANIA

### 4.4.2. Technology Transfer Centres

Given the operation difficulties experienced by several Centres and the new information technologies available, the Association has decided to defer the creation of new technology transfer centres and review its knowledge dissemination policy.

### 4.4.3. The PIARC Special Fund

The PIARC Special Fund, managed by the General Secretariat, is intended to facilitate the participation of members from developing countries and countries in transition in PIARC activities, particularly those of the Technical Committees.

Subject to a number of conditions, the Fund provides funding to cover travel or accommodation expenses for experts from developing countries who participate in PIARC activities.

From 2004 to mid-2007, 181,000 euros have enabled to help 58 persons from 24 countries, to participate in the meetings of Technical Committees, the Council, the Executive Committee and other Commissions and seminars.



#### 4.4.4. World Interchange Network (WIN)

The World Interchange Network (WIN) was founded in 1994 to help put road professionals with specific problems in touch with people who may have advice and solutions to offer.

Since the Durban Congress, contact and information requests to the World Interchange Network are made through the website of the Association.

#### 4.4.5. The PIARC / HDM-4 Project

In 1996, the PIARC Executive Committee first suggested the role that PIARC could play when taking over the management of the HDM-4 Project (software for development studies and the technico-economic management of road networks). After two years of development from 1998 to 2000, Version 1.0 was made available in March 2000 in English, French and Russian. This version was gradually corrected and improved. Version 1.3 came out in April 2001 and included a Spanish edition.

In 2002 after surveys made in the Member Countries with decision-makers, then with users, the Council adopted a resolution to develop a new version (version 2) including substantial improvements as regards both software and modelling or the introduction of new functions.

Version 2 was developed by the University of Birmingham under the operation control of the PIARC General Secretariat. The acceptance of the software occurred in 2005. In answer to a request made by the Council to externalise the future management of this Project, a 5-year service concession contract was signed in August 2005 with the HDMGlobal Consortium, following an international invitation to tender. HDMGlobal is responsible for disseminating and marketing the product, providing customer support and managing future developments to the software. (see dedicated website <http://www.hdmglobal.com/>).

## 4.5. Cooperation

One of the goals of the PIARC Strategic Plan (Goal H) is to promote cooperation with other international and regional groupings with related goals.

Cooperation covers exchanges of information, coordination of work programmes to avoid duplication, and pooling of resources for joint studies and international congresses and seminars.

Many international organisations and associations have representatives on PIARC Committees related to their activities. These include for instance but are not limited to: the European Commission, the joint OECD/ECMT Transport Research Centre, the United Nations (ILO/ASIST programme), the World Bank, IRF, FISITA, Eurobitume, Cembureau, the International Tunnelling Association (ITA), etc.

Over the work cycle, these goals were achieved in particular with the support of regional organizations of road administrations, and by formalizing links with other organizations through framework agreements.



#### 4.5.1. Cooperation with regional organizations of road administrations

A protocol of agreement was signed with the Conference of European Directors of Roads (CEDR) to ensure consistency in the activities undertaken by both organizations. Regular links are maintained with the Latin American countries through the DIRCAIBEA association. Several international seminars and the translation into Spanish of various PIARC documents were concrete results from the approach adopted towards Latin American countries. In Africa, a regular cooperation has been established with the Association of African Road Managers and Partners (AGEPAR) with the organization of three joint seminars. In the Asia-Australasia region, contacts have been strengthened with HORA (*Heads of Road Authorities of Asia and Australasia*) and REAAA (*Road Engineering Association of Asia and Australasia*).

#### 4.5.2. Cooperation with other international organizations

The World Bank and the Association signed a Memorandum of Understanding in January 2007 to increase cooperation and actions towards developing countries.

As regards international technical organizations, a protocol of agreement was signed in 2005 with the International Tunnelling Association (ITA) to coordinate the activities of both organizations in the field of road tunnels. An agreement was also signed with FISITA (International Federation of Automotive Engineering Societies) to foster technical information exchange between the automobile and the road sector.

A Memorandum of Understanding with the TRB, *Transportation Research Board* (United States), is under preparation to consolidate the current links and increase synergy between PIARC Technical Committees and TRB Committees.

## 5. FEEDBACK ON THE 2004-2007 STRATEGIC PLAN

As reported in 2.2, the 2004-2007 Strategic Plan has defined a set of organisational goals to help PIARC to fulfil its mission. It is interesting at this stage to note the actions that have been accomplished for each of these goals.

### **A – To provide and enhance international networks and forums and help members exchange information and best practice**

Six new National Committees have been set up (five during the last cycle) and at the instigation of the Chair of the Conference of National Committees, exchanges and communication have intensified among them.

The number of members and corresponding members designated by the member countries has increased (1040, against 1000 for the previous cycle).



**B – To develop and encourage professionally worthwhile and effective personal contact networks**

Close contacts are maintained between PIARC and the various regional groups of Road Directors (see section 4.5-Cooperation above).

**C – To develop practical means for efficient and effective technology transfer among countries**

22 international seminars have been organised in developing countries or countries in transition.

However, the programme to create new Technology Transfer Centres has been suspended.

Although progress has been achieved in the participation of representatives from developing countries or countries in transition in Technical Committees, especially from Africa, this participation does not have the desired continuity and remains by and large insufficient.

**D – To run Congresses that are major and valuable events ... and run them so that they are viable from PIARC's point of view**

The Durban Congress has considerably contributed to raise the profile of the Association, and to increase the interest and participation of African road administrations in PIARC activities.

The Turin Congress was well attended and produced a positive financial result for PIARC.

Hosting the XXIII<sup>rd</sup> World Road Congress in Paris in 2007 and the XIII<sup>th</sup> International Winter Congress in Quebec City in 2011 meets the desire to achieve appropriate geographical alternation to ensure presence in the various continents represented in the Association.

**E – To produce and disseminate authoritative publications ...**

A note setting out the communication policy of the Association has been prepared by the Communication Commission and approved by the Council in 2006.

The creation of the Virtual Library on the website of the Association with free access to the public represents a major step forward to extend significantly the dissemination of the results of its activities.

In addition, an internal quality control process has been put in place for the production of technical reports. They are published according to the new graphics for an improved reading comfort and image.

The Routes/Roads magazine has been restructured, both in terms of contents and format, to the satisfaction of the readers.

**F – To improve participation of member governments, and (...) increase the number of members of the road community ...**

The number of Member Countries has continued to increase, rising from 107 to 111.



PIARC's activities are relayed and spread more widely thanks to the National Committees that have developed both in terms of number and volume of activity.

However, the project to set up a group of young professionals has not been achieved during this cycle.

### ***G – To improve continuously the management and operation of PIARC ...***

Prior to the setting up of the new Technical Committees, a significant amount of preparatory work was achieved with the Theme Coordinators and the Chairs of Technical Committees. The aim was to avoid overlap of the topics for study and to enable the Technical Committees to start the work at the earliest.

The restructuring of the PIARC website has allowed it to become a true working tool for the different groups (Committees, Commissions, etc.). New functionalities have also been developed on the internet for the management and review of the paper abstracts submitted for the congresses and conferences organized by the Association.

### ***H – To promote cooperation with other international and regional groupings with related goals.***

A protocol of agreement has been signed with various other organizations in order to coordinate activities (see 4.5).

### ***I – To put transparent financial management of the Association in the service of its purpose and to optimise investment performance for the funds managed by the Association***

A detailed review of the Association's accounts has been carried out by the General Secretariat for the 1994-2004 period. The review has enabled to identify, together with the Finance Commission, the measures aimed at restoring budgetary balance. These were submitted to the Council for approval in 2005 and have been implemented since FY 2006.

### ***J – 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 refers to the work carried out by the Strategic Planning Commission, in particular the draft Strategic Plan that is to be submitted to the Council in September 2007, setting out the orientations of Association's activities for the 2008-2011 period.



## 6. PROSPECTS

At the time of writing this Activity Report, the new 2008-2011 Strategic Plan is being drawn up. It is therefore not appropriate to anticipate the Council decisions that must be taken in September 2007 in Paris, on the priorities to be given to Technical Committee work for the 2008-2011 period, on the structuring of the themes, the goals for the operation and evolution of the internal rules and organisation of the Association.

Over this work cycle, the Association has considerably consolidated its work methods and tools: setting up of the technical committees, guidelines for the production of technical reports, functionalities of the website providing work space to the different groups, dissemination of products, etc.

In addition, the Association has adopted a communication policy and has revitalized its image with both new graphics for the various tools and the use of the new electronic communication tools.

These are major achievements for the next cycle, enabling the Association to focus on other challenges including:

- improve the attractiveness of its activities with other parties than state road administrations, in particular the local and regional authorities;
- strengthen PIARC's position as a world forum for exchanges among all parties of the road and road transport sector;
- reconcile studies mainly intended for developed countries with those meeting the needs and expectations of developing countries;
- arouse the interest of young professionals and the academic world and raise their involvement in the Association.



Above:  
*Latifa El-Ayache*

Below: *PIARC staff in January 2006*





## 7. PARTICIPATION IN PIARC

### 7.1. Member Categories

There are four PIARC member categories:

1. Governments (Ministries in charge of roads and road transport),
2. Regional Authorities (first level below the national level),
3. Collective Members (Municipal Councils, universities, laboratories, consultants, contractors, etc.),
4. Individual Members.

The Member Governments are responsible for designating representatives in the Council of the World Road Association and for appointing PIARC Committee members. These representatives may belong to the public or private sector.

### 7.2. Membership Fees

The fees include the subscription to the PIARC “Routes/Roads” magazine.

#### Annual membership fees for the 2004-2007 period

	Membership fees (euros)		
	2004-2005	2006	2007
<b>Collective members</b>			
High income countries	385	410	440
Other countries	230	250	270
<b>Individual members</b>			
High income countries	46	50	54
Other countries	23	25	27

Please contact the PIARC General Secretariat for any further information:

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 92055 La Défense Cedex (France)  
 Tel +33 1 47 96 81 21  
 Fax +33 1 49 00 02 02  
 E-mail: [info@piarc.org](mailto:info@piarc.org)

[www.piarc.org](http://www.piarc.org)

President:  
 Secretary general:

**Colin Jordan (Australia)**  
**Jean-François Corté (France)**

**TECHNICAL COMMITTEE ON TERMINOLOGY  
AND TRANSLATION ASSISTANCE  
(CTERM)**

**2004-2007 ACTIVITY REPORT**

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**COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

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## 1. ACTIVITIES AND ORGANIZATION OF CTERM BETWEEN 2004 AND 2007

The Committee had seven plenary meetings:

Paris (France):	May 26-27, 2004
Madrid (Spain):	October 4-5, 2004
Sterrebeek (Belgium):	April 24-25, 2005
Budapest (Hungary):	October 6-7, 2005
Cologne (Germany):	April 27-28, 2006
Lisbon (Portugal):	October 16-17, 2006
Bergen (Norway):	April 19-20, 2007

### 1.1. The tools

#### 1.1.1 “Hard copy” terminology documents

PIARC has two “home-made” terminology documents:

The PIARC *Technical Dictionary of Road Terms* was first published in 1931. It has been the subject of seven hard copy editions since that time (the seventh edition [1] dating from 1997). For more than thirty years, it has been published in English and in French (the basic version in the two official languages of the Association), and translated into many languages including Arabic, Chinese, Japanese, and Vietnamese.

The Dictionary basically includes specific road terms validated by the competent PIARC technical committees within their respective fields of expertise and, subsequently, officially “endorsed” by PIARC. Its object is to establish a one-to-one link between French and English terms expressing the same concepts, thereby facilitating translations into other languages. The seventh edition contains about 1,500 terms – with definitions for approximately one third of these – and a few illustrations.

The PIARC *Lexicon of Road and Traffic Engineering* was first published in 1991. A second hard copy edition was released in 2000 [2].

The object of the Lexicon is to help French- or English-speaking readers to translate technical documents on roads and road operation. The second edition contains over 16,000 terms in English and French in common usage by road engineers, including – unlike the Dictionary – terms used in related fields, such as the environment, land use, geography, mathematics and statistics, etc.

#### 1.1.2 “Soft copy” terminology data base

In 1999, PIARC commissioned a French software company to develop a computer programme to make both the Dictionary and the Lexicon available in electronic form. This was the start of the “PIARC Terminology” project, which brought CTERM into the computer era.

This work resulted in the release of a CD-ROM of the same name [3]. In addition to the seventh edition of the Dictionary (in the basic version and in a few other languages: Spanish, Japanese, Russian, Portuguese and Hungarian) and the second edition of the Lexicon, this CD-ROM contained a number of specialized glossaries: one on sustainable

transport (based on a document published at the Kuala Lumpur Congress), one on bridges (English, Swedish, Finnish and German), and one on weigh-in-motion (WIM) techniques (English, French and German).

The next step, which was taken after the Durban Congress (2003), was the transition from the CD-ROM to on-line consultation, updating and translation. For this purpose, appropriate Internet software was developed from September 2003 with similar functions as those on the CD-ROM but allowing easier addition, amendment and deletion of terms, definitions and illustrations. Each of the terminology documents (“dictionaries”) 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 data base is built that can be updated and upgraded any time [4].

This “PIARC Terminology” data base is intended for three levels of use:

- a *user* can consult a dictionary – or several at the same time – for a given term; the result of the search can be displayed in three languages at a time;
- using a password, 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 terminology data bank, validates or rejects additions and amendments directly on-line.

## 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 2004-2007 [5] defined the following issues, strategies and expected outputs for CTERM:

Table I – CTERM Work Programme 2004-2007

Issue 1 Updating PIARC dictionaries	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>▪ Ensure active support from the network of correspondents from other PIARC Committees.</li> <li>▪ Develop and test a software package for multilingual dictionaries on the Internet.</li> <li>▪ Promote the inclusion of specialized glossaries in PIARC publications.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improve the PIARC Dictionary and Lexicon, including photographs.</li> <li>▪ On-going updating on the Internet of all PIARC multilingual dictionaries, with decentralized administration and access control.</li> <li>▪ Collection of glossaries designed to feed the updating of dictionaries.</li> </ul>
Issue 2 Encouraging the creation of translation memory bases	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>▪ Ensure the electronic backup, by (and for) PIARC, of bilingual documents aligned following the CD-ROUTE operating mode or by any other alignment tool.</li> <li>▪ Investigate the text alignment software packages available on the market.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Series of validated translations made available to translators and feeding of dictionaries.</li> <li>▪ Recommendations to PIARC and its national committees concerning the creation of translation memory bases.</li> </ul>
Issue 3 Adjusting translation software packages to the road field	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>▪ Investigate the upgrading of one or several translation software packages through the integration of PIARC dictionaries.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Good practice guide on one or several translation software packages.</li> </ul>

### 1.2.2 Organization of work

The updating and translation process for the PIARC Terminology data base (issue 1) works mainly through *editors*, who may choose to work either on-line (using a password received from the PIARC General Secretariat) or off line (on files in Excel format exported by the administrator of the data base 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 of the Dictionary and Lexicon, *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 languages other than French and English, *corresponding members* are appointed within CTERM by the various national committees of PIARC. They have full authority and responsibility for their translations;
- finally, the members of CTERM themselves are entitled to make proposals for the French and English terms and may be authorized by their national committees to prepare translations into their respective languages as well.

Per strategic theme (ST) selected by PIARC for the current inter-Congress period, one member of CTERM communicates as a *liaison agent* with the terminology correspondents of the technical committees working under that theme, to encourage them in their task and to facilitate the exchange of terminology data between CTERM and the committees. In the period 2004-2007, the liaison agents were:

- B. SZIRANYI for the committees under ST1 “Governance and Management of the Road System”;
- H. FRITZ for the committees under ST2 “Sustainable Mobility”;
- C. HIGUERA-TOLEDANO for the committees under ST3 “Safety and Road Operations”;
- D. POWELL for the committees under ST4 “Quality of Road Infrastructure”.

After preliminary checking and commenting, the liaison agents forward the contributions received to the team *coordinator* within CTERM.

This coordinator (D. VERFAILLIE in 2004-2007) 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 Dictionary and Lexicon, inclusion in the Lexicon only, 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 those terms where difficulties could be not 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 *administrator* of the data base.

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 – and not just before or after a congress, or on an annual basis – makes the updating and translating of the PIARC terminology data base a *continuous* process – replacing the cyclical process of the “hard copy era” and the semi-continuous (i.e. annual) process of the “CD-ROM era”.

As for issues 2 and 3 of the work programme, CTERM tested software for aligning sentences in English and French in order to allow the creation of a data base to be used for automatic extraction of terms in both languages. Published reports of PIARC are available in both languages and the translation from the source language to the target one has been validated. Then, when searching for an expression in one language it is possible to automatically find all its translations within the data base. The next step will be to compare the results with the contents of the Dictionary and Lexicon in order to enrich them.

### 1.3. Current state of progress

#### 1.3.1 *Updating*

Final comments and responses were received from TC3.2 on Risk Management, TC4.2 on Road/Vehicle Interaction, TC4.3 on Road Pavements and TC4.4 on Road Bridges. After a final discussion in CTERM’s plenary meeting, updates of the PIARC Dictionary and Lexicon for the years 2003-2004 prepared in the previous inter-Congress period [6] by the former “annual” process were put on-line in May 2005.

During the period between the Durban and the Paris congress, only three technical committees actually provided CTERM with proposals for discussion and validation:

- TC1.3 on Performance of Road Administrations;
- TC2.1 on Sustainable Development;
- TC3.3 on Tunnel Operation.

After reviewing in CTERM and final commenting and approval by the relevant committees, the validated proposals were put on-line in November 2006.

Further contributions are under preparation in Committee 4.1 on Management of Assets and Committee 4.4 on Road Bridges. Committee 4.2 on Road/Vehicle Interaction is organizing itself to make a contribution. And Committee 1.4 on Management of Network Operations is working on a French translation of PIARC’s specialized glossary on intelligent transport systems (ITS), with possible feedback to the Dictionary and Lexicon.

Committees 1.2 on Financing Road System Investment, 3.4 on Winter Maintenance, 4.3 on Road Pavements and 4.5 on Earthworks replied that they did not have any proposals for the time being – some of these committees made substantial contributions during the previous inter-congress period –.

### 1.3.2 *Upgrading*

As far as the Dictionary is concerned, R. GEMME added the Canadian synonyms to both the French and the English version. A similar effort is under way for English synonyms used in Australia and New Zealand.

As for the Lexicon, P. RETOUR and D. VERFAILLIE spent the summer of 2005 converting the term-to-term format (with a single French term translated by a single English term, and vice versa) into a concept-to-concept format (with a French term and its synonyms, if any, translated into an English term and its synonyms, if any, and vice versa). This effort resulted in reducing the number of entries in the Lexicon from over 17,000 terms to about 14,500 concepts, with the added value of the preferred term for each concept being placed in front – as in the Dictionary.

### 1.3.3 *Translations into other languages*

Translations into Serbian and Vietnamese were completed in September and December 2005, respectively. A partial Chinese translation of the PIARC Dictionary was put on-line in November 2006. Translation into the Croatian language is in progress.

The German- Portuguese- and Spanish-speaking members of CTERM updated the translation of the Dictionary in their respective languages. The updated German, Portuguese and Spanish translations are to be included with the basic French and English versions in a five-language hard copy edition of the Dictionary, to be published by September 2007.

Masamitsu WAGA, technical adviser at the PIARC Central Office, is in charge of updating the Japanese language of the Dictionary.

Morocco has proposed to translate and/or update the Dictionary into Arabic. Early in December 2006, Ukraine reported that 50 % of the terms were translated, but not on-line.

CTERM is still waiting for the designation of corresponding members to update the Italian and Russian versions of the Dictionary.

Other languages considered are Farsi and Greek.

The translation of both the Dictionary and the Lexicon into Dutch is 100 % complete and includes Belgian synonyms. The Norwegian member (Per Morten LUND) in CTERM is taking steps to have the Dictionary translated into the Norwegian language by the Paris congress (Swedish and Danish languages may follow).

### 1.3.4 *Internet terminology services*

At its meeting in Madrid in November 2006, the PIARC Council formally approved the proposal made in PIARC's Communications Commission to make the access to the PIARC Terminology data base *free for all "users"*, leaving only editors and the administrator needing a password. One of CTERM's key aspirations – already expressed in its introductory and activity reports for the Durban Congress [6] [7] – was thereby granted.

## 2. FUTURE ACTIVITIES

### 2.1. Composition of the CTERM committee

The CTERM Committee has to deal with English and French terms. Consequently, CTERM should be composed of English- and French-speaking members. Members fluent in other languages will not contribute to enrich the data base in the two PIARC official languages. A reduced team of members coming from various English- or French-speaking countries would be preferred to a large one with plenty of members coming from other countries.

### 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 those areas. Although all PIARC technical committees have appointed terminology correspondents, it has been the experience of CTERM that, with a few exceptions, the response of the terminology correspondents to the calls of the liaison agents for proposals has not been as effective as first hoped. Therefore, input for the revision of the PIARC Dictionary and Lexicon must come from the technical committees. The Dictionary and Lexicon should be the reference works of the technical committees that are active within PIARC. It is in their interests to revise terminology and transmit specialized vocabulary in their specific areas of expertise to the CTERM.

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

### 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 data base 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 Dictionary and Lexicon 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 PIARC terminology data base.

## 2.4. Contents of the Dictionary

The structure of the 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. This is why technical committees have reported difficulty with the structure of the Dictionary when they wish to review the terms for a specific subject area. Nevertheless it is not certain that the adaptation of the Dictionary to the organization of the technical committees every four years would be efficient: changes in the identification of terms will affect all the linked languages and the cost-benefit ratio of this change might be too high.

In developing and updating the basic version of the Dictionary, the opinions of the members of CTERM have long been divided between two alternatives:

- to create a definition for each term, as in most specialized dictionaries. This represents the view of those who believe that restricting the number of definitions in the 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 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 gained ground since the Durban Congress.

Better use should be made of the possibilities of data processing to supplement the Dictionary with illustrations.

## 2.5. PIARC and European standardization (CEN)

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

Although feedback from CEN working groups in the form of internationally agreed terms and definitions is hampered by the fact that terminology work in 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 CEN working groups active in road and road-related fields. Members of PIARC technical committees who participate in CEN working groups should be encouraged to report on CEN terminology work to the terminology correspondents in their committees. This would enable PIARC and CEN to harmonize their terminology for the benefit of the international road community.

Some terms and definitions “born” in the PIARC Dictionary have been adopted by CEN. Vice versa, when a CEN definition is used in the PIARC Dictionary, the origin is indicated.

## 2.6. PIARC and TERMIUM Plus®

TERMIUM Plus® [10] is an English-French-Spanish electronic dictionary consisting of terms, synonyms, acronyms, definitions, phraseology units, examples of usage and observations in a wide variety of fields such as administration, science and informatics; over three million five hundred thousand terms are in English and French and more than 190,000 are in Spanish. Its main purpose is to harmonize the terminology used by the Canadian administration.

A two-year agreement granting a few PIARC representatives (including the secretaries and the coordinator of CTERM) access to TERMIUM Plus® on the one hand and permitting TERMIUM to use PIARC Dictionary information (with acknowledgement) on the other should have a “cross-fertilizing” effect on both sides.

## 2.7. PIARC and ITRD

ITRD (International Transport Research Documentation) is an international cooperative scheme centred on a worldwide data base of published information on transport and transport research. It is one of the main activities of the Joint Transport Research Centre (JTRC) of OECD and ECMT.

A quadrilingual Thesaurus (French, English, German and Spanish) [11] allows searching through the data base by term codes which are the same whatever the language of abstract. This Thesaurus is regularly revised, corrected, complemented and updated by a Terminology Subcommittee.

In spite of the difference in approach (document indexing in ITRD versus translation assistance in PIARC), cooperation between the ITRD Terminology Subcommittee and CTERM may be useful. This may be achieved through mutual corresponding membership.

## 2.8. Improving the on-line service

Next CTERM should consider how to improve the on-line service. A survey of users may be useful for that. It is not for certain that the present layout of the terminology data base on Internet is the most suitable.

## 2.9. Towards a better exploitation of PIARC archives

If the General Secretariat of PIARC agreed to organize a systematic exploitation of its bilingual archives, CTERM may provide assistance for automatic alignment of texts and assisted extraction of terms. Building a large memory data base would offer substantial savings in translation costs.

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# **STRATEGIC THEME 1 GOVERNANCE AND MANAGEMENT OF THE ROAD SYSTEM**

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ST1 Coordinator

## **INTRODUCTION**

Strategic Theme 1 (ST1) is Governance and Management of the Road System, and under this theme, four technical committees have been operating for the period 2004 - 2007. ST1's goal is to improve the governance and management of road administration in the provision of road systems in accordance with international best practice.

In order to achieve this goal, the four Technical Committees; 1.1 (Road System Economics), 1.2 (Financing Road System Investment), 1.3 (Performance of Road Administrations), and 1.4 (Management of Network Operations), have conducted researches and investigations on various challenges that road administrations are facing.

PIARC lays emphasis on technology transfer as its primal mission. Thus one of our most important outputs is to organize seminars in developing and transition countries. Starting with the seminar on road pricing jointly organized by TC1.1 and TC1.2 in Mexico, a series of seminars were held in Tanzania, Poland, Benin, Malaysia and Chile in cooperation with other international and regional organizations which yielded many fruits.

In addition, in an effort to strengthen link with other related organizations, we organized a training session on network operation in Cape Town and collaborated with TRB on the transportation finance workshop.

Moreover, many committee members contributed to PIARC "Routes & Roads" magazine and shared their expertise and latest findings on road pricing, road financing, good governance and network operation. TC1.4. has also completed the translation of the second edition of the ITS Handbook in French and editing of ITS terminology.

The results of their hard work will be presented at the World Road Congress in Paris this September. I wish to take this opportunity to express my sincerest gratitude to each member for his/her tremendous efforts in preparing the congress sessions, seminars and reports to together achieve our goal.

I trust that the outcomes of our work will be shared and leveraged as invaluable resources for the global road community and they will contribute to further the development of road transport worldwide.

# **STRATEGIC THEME 1**

## **TECHNICAL COMMITTEE ON ROAD SYSTEM ECONOMICS (1.1)**

### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

### First-circle members (active participation)

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### Second-circle members (occasional participation)

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Joanna Gaczewska, Poland  
Trueman Goba, South Africa  
Hervé Ouedraogo, Burkina Faso  
Maurizio Rotondo, Italy  
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### **Strategic Theme Coordinator**

Keichi Inoue, Japan

## **1. SCOPE OF WORK AND FEATURES OF TECHNICAL COMMITTEE 1.1**

### **1.1. Scope of work**

The activities of Technical Committee 1.1 during the program cycle 2004-2007 have been to support the PIARC Strategic Plan goal of improving the governance and management of the road system by investigating road system economics through an exchange of information on international best practices. Several strategies were set forth in the Strategic Plan which focused on the evaluation of road system economics within an integrated (potentially multimodal) transport system, the analysis of road pricing effects on the socio-economy, and the setting of a project evaluation framework laying emphasis on social and environmental impacts. Other strategies included identifying the equity issue in road pricing, identifying and disseminating successful experiences in road pricing, and identifying and disseminating good practice in the evaluation of road transport projects.

### **1.2. Work context**

The on-going period may be characterized by two major issues that have grown into major concerns: first, an increased pressure from the general public to fully understand the rationale for developing the transport system and especially for expanding the road infrastructure and capacity: this is related to acceptability. The second issue is to have the users pay for the provision and development of road transport, which may be called an equity issue.

The increased pressure from the general public to fully understand the rationale for the development of transport systems is clear in some frequently asked questions as follows: what is the transportation problem; is there a lack of capacity or a lack in quality of service; what is the extent of the problem, where is it located, and when does it occur; could it be sufficient to better operate existing systems or to better manage travel demand, or is there a strong requirement to provide additional capacity?

Concerning the second issue of having the users pay for their use of transport facilities, in the area of road transport this leads to the issue of road pricing; not only to derive toll revenues as a funding source but also to internalize the external costs that each usage imposes on society in terms of congestion, noise, pollutant emissions, etc.

### **1.3. Committee members**

The Committee members convey the strong interest of their respective road administration in gaining additional information and a better understanding of how to more effectively and efficiently operate and manage the economic framework of their administrations. Members include economists, engineers, academics, accountants, planners and infrastructure experts. There was a high level of active participation by a core group of 15 Members, half of whom had already been involved in the former PIARC Committee C9, whereas the other half was made up of newcomers to PIARC. The work of Corresponding Members was minimal but important in providing material for reviewing current practise.

## 2. WORK PROGRAMME AND ORGANIZATION

### 2.1. Working themes

The areas of concentration for the 2004-2007 Work plans for the Road System Economics Technical Committee were:

1. Road System Economics within an Integrated Transport System,
2. Effects of Road Pricing on the Socioeconomy,
3. Road Project Evaluation Framework.

### 2.2. Sub-group 1: Road System Economics within an Integrated Transport System

Group contributors:

Andrew Clarke, England (Chair of sub-group 1)

Joanna Gaczewska, Poland

Roger Heux, France (French-speaking Secretary, 2004-2005)

Lennart Kallander, Sweden

James March, USA

Ian Melsom, New Zealand (English-speaking Secretary)

Barry Moore, Australia

Kjell Ottar Sandvik, Norway

The work of Sub-group 1 comprised the following topics:

- To study the economic evaluation methods for road projects within an integrated transport system, including the improvement of modal connections, in order to consolidate economic evaluation methods for road projects.
- To identify and study common economic evaluation methods that can be applied to all transport modes, in order to consolidate such common methods.

The main output is a technical report "Recommendations for Users in the Application of Multimodal Appraisal Systems", in which the following issues are dealt with:

- In the introduction, the scope for the multimodal appraisal of transport systems is made clear: multimodal planning is considered from a demand-oriented perspective where the transport users may choose the travel modes to make their trips. This of course exerts important effects on the supply side: the various means of transportation have to be developed and planned in an integrated, multimodal way. Excluded from the study by Sub-group 1 were the issues of integrated management and integrated financing (including cross-financing).
- Current practise in multimodal appraisal is reviewed using the results of an international questionnaire, which was answered by 28 countries. Five among these were then selected for further in-depth analysis.
- Next, seven common themes are identified as follows:
  - (i) Definition of objectives and problems;
  - (ii) Definition and screening of alternatives;
  - (iii) Involving the public;
  - (iv) Forecasting transport demand using models;
  - (v) Assessment criteria to measure projects impacts;
  - (vi) Appraisal methodology to quantify costs and benefits;
  - (vii) Decision-making framework to compare costs and benefits.

The seven themes make up an overall framework for the integrated planning of multimodal transport systems.

- The issue of transferability is discussed, concluding that the overall appraisal framework is a transferable methodology. Of course each situation may have to be tailored in a context-sensitive way.
- Lastly, the generic framework is stated in a short and effective way, with toolkits to address respectively: Modelling; Appraisal tools and procedures; Appraisal criteria; and Decision-making framework.

### 2.3. Sub-group 2: Effects of Road Pricing on the Socioeconomy

Group contributors:

Anton Goebel, Finland

Rico Maggi, Switzerland

Hisayoshi Morisugi, Japan

Erna Schol, Netherlands

Friedrich Schwarz-Herda, Austria (Chair of sub-group 2)

Arpad Siposs, Hungary

Ludmila Vodzinska, Slovakia

The work of Sub-group 2 comprised the following topics:

1. To investigate the objectives and charging methods in introducing road pricing.
2. To investigate quantitative evaluation methods on the effects of road pricing (such as congestion mitigation, reduction of CO<sub>2</sub> emissions and other pollutants), so as to provide guidelines for quantitative evaluation methods on the effects of road pricing.

The main output is a technical report “Pricing as one tool for funding and regulation with equity in mind”, in which the following issues are dealt with:

- A definitional statement of the core concepts: funding, regulating and pricing.
- A statement of the two policy objectives associated with road pricing, namely (i) the financing of construction and maintenance; and (ii) regulation to influence travel behaviour so as to meet some background goal such as mitigating the diversion of traffic on urban routes or reducing traffic peaks. There may be some intermediate objectives that combine the two basic ones. For instance, road pricing in order to finance the development or operation of public transport.
- Then a range of tools is introduced, from general taxes to area pricing, registration charges, fuel taxes, shadow tolls, fixed tolls, distance-based tolls, parking fees and link/lane pricing.
- Next the impacts of road pricing are analyzed, taking into account the overall costs, benefits, and their distribution across a population. Four sectors of society are considered, namely (i) transport users, (ii) land users, (iii) land owners, and (iv) an implementation agency.
- Equity issue arising from the analysis include: between users and non-users; across road users; and between private and public road transport. Benefit-incidence tables provide a relevant basis for the evaluation methodology.
- A related issue is that of acceptability, which must be assessed first from the point of political acceptance, and second from the point of users acceptance. In a democratic context, it is important to identify the relevant categories of actors and to evaluate their respective utility in a given transport policy scenario so as to

understand their respective interest and evaluate whether there is a majority of winners.

- The report also includes a compendium of case studies.

#### 2.4. Sub-group 3: Road Project Evaluation Framework

Group contributors:

Alan Clark, Scotland (Chair of subgroup 3)

Patrick Debaere, Belgium

Maria Fortunata Dourado, Portugal

Maxime Jebali, France (French-speaking Secretary, 2006-2007)

Juan Jose Orozco, Mexico (Spanish-speaking Secretary)

The work of Sub-group 3 comprised the following topics:

1. Defining how to quantify social and external costs for the purpose of project evaluation.
2. Identifying best practise for road project evaluation methods: i.e. methods that cover the various aspects of the project process, fully capture the diversity of road benefits, and take into account regional characteristics and social development needs.

The main output is a technical report “The Use of Monetised Values for Socio/Environmental Impacts of Road Projects”, in which the following issues are dealt with:

- Introduction is devoted to selecting a list of factors of socio/environmental significance. The following eleven factors were identified;
  - 1- Visual Impact
  - 2- Noise
  - 3- Air Quality
  - 4- Water quality
  - 5- Ecological Impacts/Biodiversity
  - 6- Geological features
  - 7- Impacts on Agriculture and Soils
  - 8- Cultural Heritage factors
  - 9- Accessibility impacts on particular social groups (low income; single parent family; non economically active; non car owners etc.,)
  - 10- Economic and Land Use impacts
  - 11- Health benefits (particularly Walking and Cycling projects).
- A Review of Current Practise was made on the basis of a questionnaire disseminated to 48 countries. Unfortunately there were only 12 responses, among which 10 were from developed countries, only 2 from developing countries, and none from transitional countries. These responses enabled Sub-group 3 to identify which social and environmental impacts are subject to monetary evaluation in the respondent countries. To partially compensate for the problem of low response, use was made of the Technical Report by the former Committee C9 on the evaluation methods for road assets – which was very comprehensive, including environmental factors and monetary values.
- The review of current practise was continued on the basis of an in-depth analysis of selected evaluation methodologies viz. those in the HEATCO European Research Project conducted by the University of Leeds, in the UK appraisal framework, and other studies conducted in the USA, Japan, Australia, New Zealand. It was found

that these methodologies are quite developed and match those from Austria, Switzerland and Germany. Monetary values are derived through contingent valuation surveys, which correspond to a given perception by a group of people at a given time, and as such they reflect context-sensitive social values.

- The above conclusion makes transferability to developing countries and countries in transition very difficult. For these countries the basic requirement is to have a transportation network available to connect the various locations to each other (providing food security and access to health and education services) and to link the country to its foreign counterparts and potential partners in trade. The impacts on the environment and the social inclusion are by nature second to this basic requirement and to the associated requirement of network maintenance.

### 3. PRODUCTION

#### 3.1. Technical reports

Recommendations for Users in the Application of Multimodal Appraisal Systems. English version expected to be available at the end of May 2007.

Pricing as one tool for funding and regulation with equity in mind. English version expected to be available at the end of June 2007.

The Use of Monetarised Values for Socio/Environmental Impacts of Road Projects. English version expected to be available by Mid June 2007.

#### 3.2. Papers in the Routes/Roads review

Leurent, F (2005) A dynamic traffic model for the economic analysis of congestion. *Routes/Roads*, 325, pp. 46-53.

Leurent, F, Minard V and Mange E (2005) Road Pricing, Financing, Regulation, and Equity: a Summary of the PIARC Seminar in Cancun, Mexico. *Routes/Roads*, 326, pp. 36-45.

Clarke, A.B. and Edwards D. (2007) Current Practice in the Appraisal of Roads within a Multimodal Planning System. *Routes/Roads*, Forthcoming in April 2007.

Morisugi, H. and Ravinder, K. (2007 ?) Benefit Incidence Table for London Congestion Pricing. To be submitted to *Routes/Roads* in May 2007.

#### 3.3. Presentations

In the Cancun Seminar (April 2005):

- Friedrich Schwarz-Herda
- Arpad Siposs

At a joint TRB-PIARC Workshop co-organized by TC 1.2 in Washington, 22 January 2006:

- Andrew Clarke
- Hisa Morisugi
- Marta Fonseca

In the Tokyo Seminar (April 2007):

- Ian Melsom
- Maxime Jebali
- Andrew Clarke
- Lennart Kallander
- Kjell Ottar Sandvik
- Jim March (presented by H Morisugi)
- H Morisugi (presented by J Ando)

### 3.4. Organization of special events

International Seminar on Road Pricing and its Impacts, held in Cancun, Mexico, 11-13 April 2005. High-level presentations were given by 22 experts. More than 150 participants attended with a very high satisfaction rate revealed. Organized by TC 1.1, with JJ Orozco as head of Organization Committee and F Leurent as head of Scientific Committee, in conjunction with TC 1.2.

Technical Seminar on the Evaluation of Road Projects, held in Tokyo, Japan, 10 April 2007. Seven presentations were given by TC 1.1 members about project evaluation methodologies and practise in their respective countries; this was followed by a stimulating debate. It was attended by about 120 participants from Japan. Organized by H Morisugi who also led the debate.

### 3.5. Other connections

Connection to the joint OECD-ECMT Research Project on *Tackling congestion in large urban areas*, 2004-2006. Fabien Leurent, Ian Melsom and Barry Moore as contributors.

Contact between Andrew Clarke and a World Bank representative in Washington, January 2006, to check whether their terminology on project evaluation could be useful.

On 6-8 June 2006, F Leurent and I Melsom took part to the Berlin meeting of the PIARC Commission for the next Strategic Plan.

### 3.6. Co-operation with other PIARC Committees

At the first meeting of the Committee in Paris in April 2004, the following Committee members were designated correspondents/contact persons to facilitate cooperation with the other PIARC Committees:

Commission for Technological Exchanges and Development

Correspondent/CP: Vratislav Skvor (Czech Republic), who was supplemented later by Maxime Jebali (France)

Commission for Terminology

Correspondent/CP: Laurent Donato (Belgium), who was replaced in October 2005 by Maria-Fortunata Dourado

The International Seminar in Cancun, 2005, was held in co-operation with TC 1.2 on Road Financing. The subsequent working meeting was a combined one with TC 1.2.

Some members of TC 1.1 attended a Workshop in Washington on 22 January 2006 on the financing.

#### 4. TERMINOLOGY WORK

One of the tasks to be developed by TC 1.1 was to review the PIARC Technical Dictionary of Road Terms. It was agreed by most of TC members that terminology was a major and urgent issue.

The work was then undertaken taking in mind the need for the terminology used in PIARC to have a common meaning and understanding (meeting in Cancun, April 2005). This work has been developed in a continuous way and it has been initiated at the level of each subgroup.

In fact, one member in each of the three subgroups was responsible (Kjell Ottar Sandvik, Friedrich Schwarz-Herda and Maria Fortunata Dourado ) to review the existing Dictionary and Glossary, to identify the concepts, the definitions and the missing concepts and definitions which were relevant to the tasks and work to be carried out in the respective subgroup.

Their reviews were to be coordinated by Maria Fortunata Dourado, responsible for the terminology issues in the TC 1.1.

Besides of the revisions and proposals of new terms made by the three subgroup members, a research was made by Maria Fortunata Dourado in order to identify new terms and respective definitions, which will be relevant to the whole WG or which will contribute to accomplish the purposes of the several and different items included in the TC themes, Road Economics System.

This research was made at a first step at the PIARC Dictionary itself and at a second level, in available bibliography of adequate/relevant organizations.

A very first draft was then produced and presented at the Kiruna meeting. This draft integrated both the revisions of concepts and proposals of new terms and definitions made by the terminology contact in each subgroup and a list of new terms and definitions resulting from the research undertaken and which were considered (by the coordinator) as relevant to the work of TC 1.1 and important to integrate the PIARC Dictionary of Road Terms. .

This first draft was discussed and contributions were asked from TC members (contributions were received from Friedrich Schwarz-Herda and Rico Maggi).

A second draft was presented at the Vienna meeting. This second draft was the result of the work undertaken between the two meetings in order to provide a better version which could provide a list of concepts and terms and definitions actually used in road economics.

A final draft prepared after the Vienna meeting only differs from the previous one because of the introduction of contributions provided by Fabien Leurent and of small and punctual adjustments in some phrases/definitions.

The methodology that was used to prepare both the first and the second drafts was as follows:

- At the very beginning, a table was made with the result of the revisions made by each one of the three subgroup members. At that time, one of the main focuses was to identify the concepts related to each of the subgroups.
- After that, the follow up was to go to the terms and definitions related to the WG as a whole.
- The first step was to identify all the existing terms and definitions in the actual PIARC Dictionary of Road Terms which will be relevant both to the work of TC 1.1 and for PIARC.
- So, a research was made going through the PIARC dictionary chapters and identifying all the relevant words that should be incorporated in the future in the chapter related to economics and finance, even if these words will be also part of other chapters.

In the PIARC Dictionary, chapter XIV, Economics and Finance, had a special attention and all the terms of this chapter were maintained in the final draft.

Other chapters in PIARC Dictionary that provided terms considered as relevant terms to be included in the draft, were chapter XVI, Environment, Nuisance, Accidents; chapter I, Types of Roads; and chapter III, Traffic and Transport.

Besides of PIARC Dictionary, a research was also made in the PIARC Lexicon on Road and Traffic Engineering, on chapters 21, Management, Financing; and 24, Mathematics, Statistics. A lot of terms considered as relevant terms to be included in the draft were then chosen.

The follow-up of this task was to get definitions for those words for which no comments or additional remarks besides of the word itself appear in the PIARC Dictionary or Lexicon and/or no proposal had been made.

Another task was to complete the list with concepts that appear neither in the PIARC documents nor in the proposals of new terms presented by the subgroup members responsible for the terminology issues.

For this purpose, a new research was made and it was possible to get additional information from documents provided by international organizations such as:

- Glossary of Key Terms in Evaluation and Results Based Management OCDE (2002);
- Roads and The Environment, A Handbook– World Bank – Technical Paper (1997);
- Other WB Documents;
- Social Costs Glossary – ECMT (Feb, 1997);
- UK Highways Agency documents;
- Sustainability Appraisal of Regional Spatial Strategies and Local Development Frameworks - Consultation paper (UK);
- Evaluation of Socio Economic Development - The Guide, EC\_ DG for Regional Policy
- Monetization of Environmental Impacts of Roads, Ministry of Transportation and Highways\_British Columbia\_Canada
- Road User Charges Manual, New Jersey Department of Transportation \_ 2001
- IBTTA documents.
- Geocities Glossary.

After this research and in order to build the tables, three different situations emerged:

- no proposal was made and the initial word and definitions remained as in the actual version;
- the initial word remained as in the actual version and a new definition was proposed;
- an existing word in other chapters than chapter XIV of the PIARC dictionary was considered important to be included in the chapter related to Economics and Finance;

a new word and definition were proposed to be included in the dictionary, in chapter XIV – Economics and Finance.

In the first situation, it was considered that no remark was necessary to be made to the existing word and definition.

In the second case, the need to consider proposals of new definitions for existing words arises from different situations:

- the need to include a new idea that was not considered (the idea of public partnership in the definition of concession),
- the need to include a more detailed and complete definition as considered in the definition of the same word in another chapter (as in the definition of criteria – the proposed definition is the one used in the chapter related to sustainable development in the PIARC dictionary),
- the need to propose definitions that seem to be more clear and easier to be understood (cost of a project; efficiency; generalized costs; externality),
- the need to propose definitions that seem to be more complete and detailed (assessment of projects; cost benefit analysis; operating cost of vehicles; performance measure; shadow toll; utility function; vehicle operating costs),

In the third case, where the word exists in other chapters than chapter XIV and it was considered important to include it in this chapter, two situations were considered:

- the word was included in chapter XIV and no remark was made for the existing definition and the definition was kept as in the previous chapters (charging operator; electronic payment; fee collection; toll collection; vehicle occupancy),
- the word was included in chapter XIV and a new definition was proposed which was considered to be more detailed and complete than the existing one (electronic fee collection; electronic toll collection; internalisation of external costs time based charging; toll plaza),

In the fourth situation, the proposal of new words and definitions to be included in the PIARC dictionary, chapter XIV, arises from different situations:

- the purpose to include all the synonymous words or concepts referred
- (evaluation and assessment; vehicle operating costs and operating costs of vehicles);
- the purpose to provide a definition for all the words that appear as part of some definition or concept and which have not been defined or considered in an independent way (direct and indirect benefit; estimated cost; evaluation period; impacts; partnership; present value; results; resources; road user; to value or to quantify a benefit; toll road; utility),
- the purpose to include words and provide definitions for words that represent important concepts in road economics (appraisal; discount rate; ex ante and ex

post evaluation; funding; multi-criteria analysis; performance; present value; purpose of the journey; road user and road user cost; sensitivity analysis; time value of money),

- the purpose to include new words that are related to more recent realities (benchmarking; city toll; congestion pricing; monetized criteria; partnership; peak hour pricing; value for money; vignette; willingness to pay).

Most of the words proposed to be included represent at the same time two or more of the purposes described (partnership, road user, ex ante and ex post evaluation, present and future value).

## 5. MEETINGS AND TECHNICAL VISITS OF THE COMMITTEE 2004-2007

The committee members representing the host countries, in collaboration with the PIARC National Committees, organized the regular meetings of Committee 1.1. The meetings lasted two days, except the last one in Japan which was extended to 3 days. On an average 15 members of the committee attended each meeting. At the committee's opening plenary session, following introductions and a welcome address of the host organization, the chair and the secretaries informed participants about on-going activities of the World Road Association (PIARC) and presented communications from the Secretariat General and other PIARC committees. The plenary session also included a presentation by a representative of the host country on a related topic of national relevance. After the plenary session, each of the three Sub-groups met to discuss their work areas. Each leader of the Sub-groups presented progress reports at the final plenary session and all committee members were invited to comment on the reports and contribute to the work. There was a great deal of constructive discussion on the topics.

A preliminary agenda for the committee meetings was prepared by the chair and secretaries and communicated to the host member. After arrangements had been completed, the chair instructed the secretaries to forward information on the meeting venue and the invitation to the meeting to the committee members. Minutes of the meetings were prepared by the secretaries, reviewed and approved by the chair and then were sent to the committee members. The overall organization and management of the regular meetings and the distribution of the relevant materials met the needs of the members and the corresponding members.

Regular meetings and technical visits of the committee were held as follows:

- |  |   |
|--|---|
| 1. Paris, France                       | 23-24 April 2004  |
| 2. Lisbon, Portugal                    | 12-13 October 2004,   |
| 3. Cancun, Mexico                      | 13-14 April 2005  |
|  | Immediately following the International Seminar 10-12 April 2005              |
| 4. Bratislava, Slovakia                | 5-6 September 2005  |
|  | Technical Tour: construction of new motorway                                  |
| 5. Washington DC, USA                  | 19-20 January 2006  |
|  | Immediately followed by a joint TRB-TC 1.2 Workshop on 22 January 2006        |
| 6. Kiruna, Sweden                      | 20-21 June 2006   |
|  | Technical Tour: Iron Ore Mine   |
| 7. Vienna, Austria                     | 9-10 November 2006  |
|  | Technical Tour: ASFINAG Motorway Operation Center; motorway construction site |
| 8. Kamakura, Japan                     | 11-13 April 2007  |
|  | Immediately following the Technical Seminar in Tokyo, 10 April 2007           |
| 9. Paris, France (World Road Congress) | September 2007  |

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# **STRATEGIC THEME 1**

## **TECHNICAL COMMITTEE ON FINANCING ROAD SYSTEM INVESTMENT (1.2)**

### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

Sherri Y. Alston, United States  
Curtis F. Berthelot, Canada  
Francesco Gaeta, France  
Gerardo L. Gavilanes Gineres, Spain  
Kathryn Martin, Australia  
A.R.M. Anwar Hossain, Bangladesh  
Filip Boelaert, Belgium  
Eric Ghilain, Belgium  
Tony Varriano, Canada  
Jani Saarinen, Finland  
Michel DeMarre, France  
Alain Fayard, France  
Dr. Jozsef Palfalvi, Hungary  
Alireza Nematollahi, Iran  
Maria Pia Cerciello, Italy  
Takaaki Nambu, Japan  
Yacouba Sidibe, Mali  
Amado Athie, Mexico  
Kjersti Billehaug, Norway  
Pedro Moniz, Portugal  
J. J. Koos Smith, South Africa  
Gunnar Tunkrans, Sweden  
Hans Schaller, Switzerland  
Geert Fuchs, The Netherlands  
Rui Manteigas, Portugal  
Henri Chua, United Kingdom  
Cristina Tello Blasco, Spain  
Ibrahima Sow, Guinea

## 1. GENERAL AND CONTENTS

### 1.1. General

The activities of Technical Committee 1.2 – Financing Road System Investment have supported the PIARC 2004-2007 Strategic Plan's Strategic Theme 1 – Governance and Management of the Road System. Strategic Theme 1 focuses on necessary measures to improve the governance and management of road administrations in the provision of road systems in accordance with international best practices. In particular TC1.2 was to consider effective management measures in both developed and developing countries that support sustainable development, such as financial procurement strategies, cost management for long term investments and the role played by road administrations in public private partnerships (PPP). Several strategies were identified to pursue these issues. Investigation of the evolutions in the various financial strategies and investigation of the forms of user charges and how they are used as a means of financial strategy were considerations in the exploration of financial strategies. Other strategies included investigation of methodologies applicable at project level for cost estimates concerning long-term road infrastructure including cost management methods; evaluating cost methods which make a proper appraisal of road assets and studying strategies for the effective allocation of funding for new development and maintenance projects. Additional strategies concentrated on public private partnerships include exploring the protection of public sector oversight and the necessary expertise for road administrations for the management of PPP contracts; investigating the effect use of PPP as a fund procurement and analyzing the experience gained from past PPPs.

The Committee members reflect the strong interest of road administrations in gaining understanding on how to more effectively and efficiently operate and manage their systems with constrained financial resources. Members include engineers, economists, planners, asset managers, and financial managers. There was a high level of active participation by Members and Corresponding Members that contributed to the overall achievement of the Committee's work.

A critical issue for all countries is financing a transportation infrastructure that supports sustainable development. Traditionally funding for roads and motorways was provided through public financing with some private sector resources that were defined by the structure and challenges of individual countries. Today countries are facing difficulties in allocating their financial resources among critically needed maintenance, the desire to secure new infrastructure to increase network capacity and the preservation of existing roadways. Finding appropriate and viable financing mechanisms presents a challenge for the public sector. It is within this environment that the members of Technical Committee 1.2 conducted their research activities. The work of the Committee was done through a framework that viewed the topic of financing from a multi-country perspective through discussions of financial procurement strategies, cost management for long term investment and the role of public-private partnerships.

## 1.2. Work Programme and Organization

TC1.2 was organized into three working groups: Sub-group 1 – Exploration of financial procurement strategies; Sub-group 2 – Cost management for long-term investment; and Sub-group 3 – Public-private partnerships for roads and road transport administration.

### 1.2.1 *Sub-group 1 – Financial Procurement Strategies*

Sub-group 1 explored the following strategies:

- Investigate the evolutions in the various financial strategies (innovative solutions, difficulties met, efficiency, allocation of earmarked funds, etc); and
- Investigate the forms of user charges (including road tolls) and how they are used as a means of financial strategy.

The group was under the leadership of Alain Fayard, France and other group members included Francesco Gaeta, France; Maria Pia Cerciello, Italy; Hans Schaller, Switzerland; A.R.M. Anwar Hossain, Bangladesh; Takaai Nambu, Japan; and Ibrahima Sow, Guinea.

The group focused its work on two main issues: (1) road administrations organization and (2) sources of infrastructure financing. The approach used was to describe existing organizations and financing mechanisms and to analyze existing and future trends. Information for these areas was provided by TC1.2 committee members for their individual countries through a comprehensive survey. From the survey it was determined there are essentially four possible models of road administration organizations. These include governmental administrations, local administrations; public agencies or public companies and private companies. Organizational trends were also defined from centralization to decentralization as well as certain road networks being managed by a central structure. Road network management was studied from the perspective of main networks and local networks. Sources for financing road transport included national or local budgets, earmarked taxes, tolls and user charges, and private financing. Trends were also analyzed to determine the relationship between financing, networks and organizations. The results of this analysis will be part of the final report of the Committee.

### 1.2.2 *Sub-group 2 – Cost Management for Long Term Investment*

Sub-group 2 considered the following strategies:

- Investigate methodologies applicable at project level for cost estimates concerning long-term road infrastructure investment including cost management methods;
- Investigate cost management methods which make a proper appraisal of road assets; and
- Investigate strategies for the effective allocation of funding of new development and maintenance projects.

The sub-group was chaired by Jani Saarinen, Finland and included: Dr. Jozsef Palfalvi, Hungary; Gunnar, Tunkrans, Sweden and Geert Fuchs, The Netherlands.

The sub-group focused on several issues including:

- Cost management for road systems within budget or economic constraints on network or state level;
- Allocation of funding for maintenance, new development and other operations;
- Cost management methods based on valuation or accounting of road assets;
- Cost management for road infrastructure investments or projects; and
- Cost management based on innovative procurement methods.

Research on these issues encompassed work of former PIARC Committees C6, C9 and C15 as well as reports for the OECD, EU, World Bank and the U. S. Department of Transportation. Case studies also came from Technical Committee members as the result of a survey was conducted among the members. Some of the conclusions will focus on implications of road budgets as part of state budgets and relationships to GDP; allocation methods; and distribution of road management costs. Other conclusions will highlight asset valuation and asset values. Systems to plan cost estimates and budgets for capital investment projects as well as trends or best practices in different countries will also be summarized. The results of the sub-group's work will be part of the final report of the Committee.

### 1.2.3 *Sub-group 3 – Public Private Partnerships*

Sub-group 3 concentrated on the following strategies related to public private partnerships for roads and road transport administration:

- Explore the protection of public sector oversight and the necessary expertise for road administrations for the management of PPP contracts;
- Investigate the effective use of PPP as a fund procurement measure; and
- Analyze the experience gained from past PPPs: failures, best practices and trends for the future.

The Sub-group was led by Koos Smith, South Africa and included the following members: Tony Varriano, Canada; Kathryn Martin, Australia; Henri Chua, United Kingdom; Gerardo Gavilanes Gineres, Spain; Michel DeMarre, France; Amado Athie, Mexico; Kjersti Billehaug, Norway; and Rui Manteigas, Portugal.

To develop the strategies, the sub-group emphasized the following:

- Drivers of public private partnerships;
- Basic prerequisites to achieve drivers;
- Continuum of PPP models to achieve objectives;
- Basic risks of PPP to be managed;
- Balance between risk allocation/mitigation and regulation; and
- How to achieve effectiveness.

With extensive information already available on PPPs, various literature sources were supplemented with recent case studies from seminars in Canada, Mexico and South Africa. Previous work by PIARC committees on PPPs was also reviewed. The study investigated fund procurement, institutional capacity; performance and efficiency, accelerated benefits; and performance and quality. The results of this work will be summarized in a final report of the Committee.

### 1.3. Meetings and Technical Visits of the Committee 2004-2007

The Committee Members representing the Host Country, in collaboration with the PIARC National Committees, organized the regular meetings of TC1.2. On average 20 members of the Committee attended the sessions. The meetings were composed of an opening plenary session which addressed on-going activities of PARC and presented communications from the Secretary General of PIARC and other PIARC Committees. Then the individual sub-groups met to conduct their work and a final plenary session was held to present progress reports on sub-group activities. These sessions allowed sharing of information about Committee research efforts and on activities underway in individual countries. After the meetings, minutes were prepared in English, French and Spanish and sent to PIARC. TC1.2 was extremely fortunate to have the services of the Secretaries in all three languages. In addition to the working sessions, host countries arranged technical tours during the Committee's meetings.

Meetings including seminars and technical visits of TC1.2 were held as follows:

- |                                |               |
|--------------------------------|---------------|
| 1. Paris, France               | April 2004    |
| 2. Helsinki, Finland           | July 2004     |
| 3. Kananaskis, Alberta, Canada | December 2004 |
| 4. Cancun, Mexico              | April 2005    |
| 5. Cape Town, South Africa     | November 2005 |
| 6. Madrid, Spain               | June 2006     |
| 7. Budapest, Hungary           | October 2006  |
| 8. Arusha, Tanzania            | April 2007    |

In addition, extra work sessions were held by some of the working groups.

## 1.4. The Productions (publications, seminars and participation in other events)

- Public Private Partnership Workshop, Kananaskis, Canada December 2004
- Kjersti Billehaug (Norway, Member TC1.2) – The Norwegian PPP Pilot Road Program.
- Gerardo Gavilanes Gineres (Spain, Spanish Secretary TC1.2) – Spanish PPP Bidding Process.
- Michel DeMarre (France, Member TC1.2) – Drivers of PPP Projects.
- Tony Varriano (Canada, Member TC1.2) – Public Private Partnerships and Federal Funding Contributions.
- Koos Smith (South Africa, Member TC1.2) – PPP in South Africa.
- Kathryn Martin (Australia, Member TC1.2) – PPP and Road User Charging Roads in Australia and NZ Freight Management in West Australia.
- Takaaki Nambu (Japan, Member TC1.2) – Financing for Road Maintenance and Improvement in Japan.
- Jani Saarinen (Finland, Member TC1.2) – Life Cycle Cost Model and PPP in Finland.
- Curtis Berhelot (Canada, English Secretary, TC1.2) – Saskatchewan Road Strengthening Engineering.
- Rui Manteigas (Portugal, Member TC1.2) – The Portuguese Motorway Concessions Programme.
- 2004
- Dr. Jozsef Palfalvi (Hungary, Member TC1.2) – Cost Management and Analysis, paper prepared for Institute of Transport Sciences, Hungary.
- International Seminar on Road Pricing with emphasis on Financing, Regulation and Equity, Cancun, Mexico, 11-13 April 2005
- Sherri Alston (United States, Chairperson, TC1.2) – PIARC Strategic Theme 1 – Governance and Management of the Road System.
- Curtis Berhelot (Canada, English Secretary, TC1.2) – Chair, Session on Road Pricing Schemes and Demand Management.
- Alain Fayard (France, Member TC1.2) – European Union Policy in Road Charging.
- Route/Roads. 2005, No. 327, pp.46-53
- Gerardo Gavilanes Gineres (Spain, Spanish Secretary, TC1.2) – Public Private Partnership Road Contracts in Spain, A new Focus?
- Cape Town, South Africa, 14-15 November 2005  
Held joint session with TC2.1 – Sustainable Development and Road Transport for presentation from South Africa on road infrastructure investment needs and sustainable development.
- Washington, DC, United States, 22 January 2006 – Transportation Research Board Workshop on Innovations in Project Delivery and Financing for Surface Transportation Infrastructure, jointly sponsored by TRB, OECD/ECMT and PIARC.
- Sherri Alston (United States, Chairperson, TC1.2) – Session moderator
- Alain Fayard (France, Member TC1.2) – Private Sector and Autonomous Agencies' Participation for Highways within the EU Legal Framework.
- Berlin, Germany, 6-7 June 2006 – Meeting of PIARC Strategic Theme Coordinators, TC Chairs and Secretaries

- Sherri Alston (United States, Chairperson, TC1.2) and Francesco Gaeta (France, French Secretary, TC1.2) represented TC1.2 at meeting of ST1 Coordinator and other ST1 Technical Committees to discuss current work program activities and plans for World Road Congress in 2007. Ms. Alston and Mr. Gaeta also participated in meeting with other ST Coordinators and TC Chairs and Secretaries on proposals for Strategic Plan for next work cycle and activities for World Road Congress in Paris in September 2007.
- June 2006 – Issued Call for Individual Papers for World Road Congress in September 2007 on topic of Innovative Financing for Sustainable Transportation Infrastructure.
- Routes/Roads 2006 – No. 332, pp. 22-23
- Sherri Alston (United States, Chairperson, TC1.2) – An overview of PIARC studies on financing road system investments.
- Routes/Roads 2006 – No. 332 pp.62-73
- Sherri Alston (United States, Chairperson, TC1.2) and Shirley Ybarra – Public and private investment in the road network in the United States.
- International Seminar on Road Financing and Investment, 16-20 April 2007, Arusha, Tanzania
- Sherri Alston (United States, Chairperson TC1.2) – Session moderator.
- Takaai Nambu (Japan, Member TC1.2) – History of Road Development, Finance and Investment in Japan.
- Jani Saarinen (Finland, Member TC1.2) – Road Asset Valuation & Management – Case Study Finland.

# **STRATEGIC THEME 1**

## **TECHNICAL COMMITTEE ON PERFORMANCE OF ROAD ADMINISTRATIONS (C1.3)**

### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

### Having contributed directly to the Activities

Antoine Averseng, France  
Odile Grisaud, France  
Andras Gulyas, Hungary  
Marcello Luminari, Italia  
Martin Fletcher, New Zealand  
Brian Hasell, New Zealand  
Paul Van Der Kroon, The Netherlands  
Olaf Vroom, The Netherlands  
Witold Zapasnik, Poland  
Ludomir Szubert, Poland  
Jorge Zuniga Santo, Portugal  
Hein Van Gerve, South Africa  
Heidi Harper, South Africa  
Katarina Noren, Sweden  
Randy Halvorson, USA  
Tony Parker, Wales

### Members of the committee

Erwin Van Dessel, Belgium (till October 2005)  
Alain Lefebvre, Belgium  
Yvon Loyaerts, Belgium  
Stanislas Bere, Burkina Faso  
Regent Dickey, Canada  
Bernard Letarte, Canada - Quebec  
Blaise Onanga, Congo  
Soren Fogh, Denmark  
Tapani Maatta, Finland  
Antoine Averseng, France (from March 2006)  
Odile Grisaud, France (till February 2006)  
Souleymane Doumbouya, Guinea  
Andras Gulyas, Hungary  
Subir B.Basu, India  
Ali Lofti-Katooliliran  
Marcello Luminari, Italia  
Daisuke Maruyama, Japan  
Asao Yamakawa, Japan  
Gabouné Keita, Mali  
Fernando Rodarte, Mexico  
Martin Fletcher, New-Zealand (from October 2005)  
Brian Hassel, New Zealand (till October 2005)  
Jan Fredrik Lund, Norway  
Sharif Tahir, Pakistan  
Ludomir Szubert, Poland  
Witold Zapasnik, Poland  
Jorge Zuniga Santo, Portugal  
Ioan M. Druta, Romania

Bassirou Guisse, Senegal  
Mamadou Tidiane Kane, Senegal  
Marianne Tounkara, Senegal  
Milan Hulej, Slovak Republic  
Hein Van Gerve, South Africa (till 2006)  
Heidi A. Harper, South Africa (from August 2006)  
Rodolfo Saenz de Ugarte Corres, Spain  
Katarina Noren, Sweden  
René Suter, Switzerland  
Olaf Vroom, the Netherlands  
Paul Van Der Kroon, the Netherlands  
René Vaandrager, the Netherlands  
Peter Ssebanakita, Uganda  
Tony Parker, United Kingdom  
Randy Halvorson, USA  
John Makadho, Zimbabwe  
Nelson Kudenga, Zimbabwe

Associated members

Mario Arata, Italia  
Mark C. LarsonUSA  
Mieczystawa Cellary, Poland

## 1. BACKGROUND

### 1.1. Introduction

The World Road Association (PIARC) has established a Technical Committee, C1.3 Performance of Road Administration, to undertake activities in accordance with the PIARC Strategic Plan 2004-2007.

C1.3 goal is to improve the performance of Road Administration in the provision, operation and management of road infrastructure and its use in accordance with best practice.

### 1.2. Terms of Reference

The Terms of Reference of C1.3 Committee is as follows:

Issue 1.3.1 - Governance and Structure of Road Administrations	
Strategies	Outputs
<ul style="list-style-type: none"> <li>● Analyse the evolutions of the modes of organization of road administrations and of their resources</li> <li>● Identify, for the different levels and bodies of road administrations, best practices to meet the diversified needs of road users and stakeholders in accordance with a country's socioeconomic development level</li> <li>● Investigate policies for eliminating corruption</li> </ul>	<ul style="list-style-type: none"> <li>● Recommendations according to the various development of the road systems</li> <li>● Best practices to meet the diversified needs of road users and stake holders</li> <li>● Recommendations</li> </ul>

Issue 1.3.2 - Development of Human Resources Skills	
Strategies	Outputs
<ul style="list-style-type: none"> <li>● Investigate what are the competences necessary to face the future challenges, identify what should be changed and/or introduced in education curriculum</li> <li>● Identify new ideas, innovative methods introduced in the field of education and training in road and road transport (within the different contexts of developed and developing countries)</li> </ul>	<ul style="list-style-type: none"> <li>● Recommendations</li> <li>● Best practices</li> </ul>

Issue 1.3.3 - Application of performance indicators of the road system	
Strategies	Outputs
<ul style="list-style-type: none"> <li>● Investigate the performance indicators which are actually implemented by road administrations and how these indicators are obtained and used</li> <li>● Investigate policy evaluation based on performance indicators in accordance with a country's socioeconomic development level <ul style="list-style-type: none"> <li>- how indicators match daily needs</li> <li>- means for data management</li> <li>- assess the level of achievement</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Best practices to improve the transparency and efficiency of administration through the application of performance indicators</li> <li>● Best practices for policy evaluation and the application of the results for integration into new projects</li> </ul>

## 2. WORK PROGRAM AND ORGANIZATION

### 2.1. Organisation

The Technical Committee started just as all TC's in April 2004 in Paris. Around 30 participants from Europe, US, Canada, New Zealand and a large delegation from Africa attended this first meeting.

At the beginning the Chair presented a framework for developing our work, partly based on an earlier framework being presented by the Technical Committee C 15 in October 2003 in Durban (SA). The framework launched encompassed a more holistic approach to the Road Administrations (RA).

The chair initiated three parallel sessions to cover each of the three elements of the ToR; realizing that in one session in fact two sub elements of the ToR, Issue 1.3.1 - Governance and Structure of Road Administrations, being evolution of RA's and Fight Corruption, were at stake. Out of those three parallel sessions three working groups were formed, while the reporters out of the sessions could be persuaded to act as working group leaders. From the start there was an un-balance in numbers of participants in the parallel sessions. The session on the issue 1.3.1. - Application of performance indicators of the road system - attracted by far the most participants, while the session on the Issue 1.3.2 - Development of Human Resources Skills - could hardly find any. In fact this trend remains consistent through out the whole cycle.

In the plenary meeting a French and an English-speaking secretary were found spontaneously. In order to safeguard consistency in working methods and outputs of the TC a so-called Steering Committee (SC) has been set up to help the Chair with his tasks and duties. This Committee consists of two secretaries, three working group leaders and the Chair of the TC. This structure has worked well all along the cycle of the TC, despite all personnel changes that took place.

Already at the second meeting the appointed working group leader of the working group for the Issue 1.3.2 - Development of Human Resources Skills did not show up and in fact we never saw him again after "Paris". So during almost the entire cycle there has not been a working group leader for this issue. On top of that all participants who were in "Paris"

sooner or later left the TC. The group was more or less hold “in the air” by the Chair of the TC and the respectively English-speaking secretariat, being strengthened at the end by a specialist from South Africa.

In the fifth meeting, in October 2005, a change took place in the English-speaking secretariat, while in the spring of 2006 we could welcome a replacement from the French-speaking secretariat. Finally by the beginning of 2007 the working group leader of the working group on issue 1.3.1 - Governance and Structure of Road Administrations - changed her job and went from the Swedish Road Administration to the Swedish Rail Administration. Although the intention was to keep going to the end of the TC, effectively in the spring of 2007 the working group leader had to be replaced

Overseeing the whole cycle, only two out of six members of the original Steering Committee being the leading figures for the TC, will return to Paris.

## 2.2. Work Program

While the TC could not finalize its initial working program at her first meeting an intermediate meeting in Amsterdam in July 2004 was found necessary. In this second meeting a solid foundation could be made for the working program of the three Working groups for the coming years.

An important part of the work was to inquire about the state of the art with regards to the issues within the ToR. In fact the TC has to deal with 4 different issues, being fighting corruption a sub-element within the issue 1.3.1 - Governance and Structure of Road Administrations. In principal there was a tendency to conduct 4 different questionnaires. Much effort has been undertaken to produce only one comprehensive questionnaire that was based on the framework earlier presented in which each working group could lay down their important questions. This was mainly the outcome of the third meeting.

After extensive testing we were able to launch the questionnaire in the spring of 2005 and in the fourth meeting among other things members were trained to fill in the questionnaire in order to get a higher response and a better quality of the output. The first results came back in the autumn of that year and those prelim findings were discussed in the TC meeting and presented on the international seminar in Warsaw in October 2005.

During a large part of 2006 much work had still to be done in testing the hypotheses of good practice within different socio-economics surroundings for the issues 1.3.1 (Evolution of RA's) and 1.3.3. (Performance Indicators). Complications had to be encountered because an element of which the work was based; namely the Cox model, was found not valid anymore. Cox suggests that in a mature network a decline of investment should take place, while our material showed that it was not the case any more.

A mayor element was found in the relationship between activities/tasks carried out by RA's and the way they are steered. The remaining part of 2006 was merely used to find and discuss good practices and set up a framework for reporting.

Being a part of the working group 1.3.1 - Governance and Structure of Road Administrations - a rather small team of merely two delegates worked on Corruption Fighting. First an extensive desk research took place followed by analyses of the output of questionnaire on how Corruption Fighting was being handled by RA's. Intensive discussions have been undertaken resulting in widening the scope of the TC from

investigating policy for and deliver recommendations to investigate Corruption Fighting to Institutional Integrity, mainly for a couple of reasons:

1. Institutional Integrity covers better all the aspects are confronted with;
2. Institutional Integrity encompasses a policy of a holistic approach Road Administrations can follow;
3. Institutional Integrity creates a much more positive attitude than Corruption Fighting.

Besides that the TC found it of outmost importance that the issue of Institutional Integrity should be high on the agenda of PIARC. Discussions took place with the PIARC Hierarchy to find a forum. Finally the Chair could present some prelim findings and a plea for a statement on the meeting of the Strategic Plan Commission.

In the meanwhile within the working group dealing with the issue 1.3.2 - Development of Human Resources Skills - a mayor shift in participation took place. In an early stage it was recognized that within the TC there was a lack of experienced members and knowledge on the topic. To overcome that the TC initiated two international Workshops being attended by senior HRM managers of the same organisations of the TC members. In total we had more than 10 different countries participating. For almost every HRM manager this was his or her first professional international experience. The outcome of these workshops deepens the understanding of the TC in the mainstream problems of HRM being: recruitment, retaining and getting maximum value of existing staff. Besides that it strengthens the idea of the large threat almost all RA's will face namely an aging work force.

As a direct spin off of this activity momentarily a workshop will be organized to search for a more sustainable relationship between 6 of the participating RA's in exchanging knowledge and staff.

The working group on the Issue 1.3.3 - Application of performance indicators of the road system - had difficulties in getting good material valid for finding good practices. At the end of the cycle they initiated and produced a so-called Performance Indicator navigator. The navigator can help staff in finding the right PI's suitable for their situation. The navigator will be supported by software. The technical report to produce will be supported either by a CD or a link to a website.

The TC organised two international seminars one in Warsaw, Poland and one in Cotonou, Bénin. Both were successful and contribute to the exchange of knowledge within the regions where the seminars were held. On top of that the seminar was also extremely worth for the better understand of the issues for the TC's and to wide their scopes for the output of the work of the TC.

### 3. ACTIVITIES AND PRODUCTIONS

#### 3.1. Activities

C1.3 held the following meetings:

##### Full Committee Meetings:

Paris	France	April 2004
Amsterdam	Netherlands	July 2004
Cape Town	South Africa	November 2004
Lisbon	Portugal	June 2005
Warsaw	Poland	October 2005
Minneapolis	USA	April 2006
Stockholm	Sweden	October 2006
Cotonou	Bénin	March 2007

##### Internal cross-over Workshops:

Rome	Italy	March 2006	(Working Group 3)
Budapest	Hungary	May 2007	(Working Group 1 & 3)

##### Internal meetings:

Several meeting within WG 1 and WG 3 took place

##### Tele- and video conferences

Around end 2006 beginning 2007 the steering Commit held several video and Teleconference.

##### Steering Committee meeting

Cardiff	UK	July 2007
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#### 3.2. Productions

##### A. Publications

The C1.3 Committee has and will produce the following reports:

- Articles in Routes/Roads (World Road Association – PIARC)

Two articles of Mr. Singh; one article of Mrs Odile Grisaud; one article of Mr. Taapani Maati and an article of the seminar in Warsaw were produced

- PIARC Reports 2007
  - Good Governance and Integrity (soon to be released)
  - Performance Indicator (soon to be released)
  - Human Resource Management (soon to be released)

➤ Seminars

C.1.3 planned and conducted:

- in conjunction with GDDKiA (Poland) and Polish Road Congress, a regional seminar on: “Good Governance, institutional integrity, and Human Resources Management for Road Administrations” 20-22 October 2005, Warsaw, Poland
- with the participation of the Beninese PIARC National Committee and the AGEPAR-Committee Benin an international seminar on “Institutional capacity building, human resources management and good governance”, 21- 23 March 2007, Cotonou, Benin

➤ Events

C.1.3 planned and conducted

- a first international HRM Workshop, 15-16 September 2005, Budapest, Hungary
- a second international HRM Workshop, 5-6 April 2006, Riga, Latvia

The chair of TC 1.3 was invited to held a presentation on "Institutional Integrity" in the Strategic Planning Commission of PIARC, 7 May 2007, Rome, Italia

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## **STRATEGIC THEME 1**

### **TECHNICAL COMMITTEE ON MANAGEMENT OF NETWORK OPERATIONS (C1.4)**

#### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

Wayne Berman, USA  
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Kan Chen, USA  
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Sandra Sultana, Canada  
Hiroo Yamagata, Japan

## **1. OVERVIEW OF THE TECHNICAL COMMITTEE 1.4, MANAGEMENT OF NETWORK OPERATIONS, FOR 2004 TO 2007**

### **1.1. Background**

The Strategic Theme 1 investigates the necessary measures to improve the governance and management of road administration in the provision of road systems in accordance with international best practice. Specific to TC1.4, this includes the following issues:

- new ideas for network-wide management and operations, with an emphasis on customers in the provision of services,
- information management and the public interest, and
- appropriate use of ITS for an integrated transport system.

The goal of the technical committee 1.4, Management of Network Operations, as per strategic plan, is to address the three issues listed above by collecting new ideas and tools for wide network operations, by investigating information management that can contribute to enhance services standards, and by studying the necessary scheme assessment and performance evaluation methods concerning ITS services.

### **1.2. Activities**

The strategic plan provided a good framework for TC1.4 to start work but the scope, encompassing 3 major topics was found to be far too broad. In practice there was a choice in how to use the meetings:

- Networking: by the members for the benefit of the members: sharing knowledge on the basis of presenting and disseminating case studies drawn from the expertise of the committee.
- Preparation of publications: to augment and update the output from the previous committee (C16), i.e. the ITS Handbook 1999/2005 and the Network Operations handbook 2003.
- Outreach through supporting international seminars and workshops, to give occasion to more people to participate and know about PIARC.

Networking to share knowledge and information about current work activities was the main motivation for the active members to attend the meetings. Network Operations is a subject that is changing rapidly. Time spent drafting reports and debating recommendation takes away time for sharing our knowledge. We therefore decided to devote a significant part of each meeting to a workshop for members to present and discuss their work in progress. These experiences were written up as case studies of Network Operations and incorporated into the end product as a CD-ROM.

## 2. WORK PROGRAMME AND ORGANIZATION

### 2.1. Summary of Meetings

	DATE	LOCATION	OVERVIEW	Attendance Members	Attendance Non Members
1	April 29 <sup>th</sup> & 30 <sup>th</sup> , 2004	Paris, France	Kick-off meeting, introduction and work plan overview	31	0
2	October 16 <sup>th</sup> & 17 <sup>th</sup> 2004	Nagoya, Japan	In conjunction with the 11 <sup>th</sup> ITS World Congress	22	10
3	May 14 <sup>th</sup> & 15 <sup>th</sup> , 2005	Cape Town, South Africa	In conjunction with the South African Society for ITS eMobility Conference	17	7
4	September 24 <sup>th</sup> & 25 <sup>th</sup> , 2005	Cardiff, United Kingdom	Workshop to define and specify key TC1.4 deliverable (CD-ROM)	17	3
5	November 5 <sup>th</sup> , 2005	San Francisco, USA	In conjunction with the 12 <sup>th</sup> ITS World Congress	15	2
6	April 3 <sup>rd</sup> , 4 <sup>th</sup> & 5 <sup>th</sup> , 2006	Amsterdam, Netherlands	Workshop to develop key TC1.4 CD-ROM Handbook	18	6
7	August 13 <sup>th</sup> to 17 <sup>th</sup> , 2006	Kuala Lumpur, Malaysia	In conjunction with a PIARC International seminar on ITS. Also held a 1/2 day training session	18	3
8	October 23 <sup>rd</sup> & 24 <sup>th</sup> , 2006	Budapest, Hungary	In conjunction with the "on safe roads in the XXI century" 4 <sup>th</sup> conference	17	4
9	January 2007	La Defence Cedex, France	Discussion and finalization of the CDROM format and content	9	1
10	April 10 <sup>th</sup> to 13 <sup>th</sup> , 2007	Santiago Chile	International Seminar on ITS and Road Safety, jointly with TC3.1	tbc 4	0
11	April 26 <sup>th</sup> & 27 <sup>th</sup> , 2007	Toronto, Canada	Workshop on cooperative vehicle-highway systems (in conjunction with ITS Canada)	tbc 11 + 40 by video conf	tbc approx 8

## 2.2. Committee Secretaries

At the kick off meeting the English and French Secretaries were identified, specifically Bob Peters from Australia and Jean-François Janin from France. Within 12 months Bob Peter's professional responsibilities changed and his PIARC membership was transferred to TC3.1. Ralph Jones of Canada stepped into the vacancy, but suffered a serious infection whilst in South Africa following the Cape Town meeting in May 2005. Deborah de Grasse of Transport Canada substituted for Ralph from the 5<sup>th</sup> meeting, in San Francisco.

## 2.3. Working Groups

The Committee has operated with three working groups.

Issue 1: New ideas for wide network operation

The meaning of "wide network operations"

Who sets the (road) network development goals, and

What are the current issues and hot topics?

Issue 2: Information management

Various members identified the challenges they have within their own countries on information management. A task force was identified to make proposals for outputs and a work program identified.

Issues 3: Appropriate use of ITS and integrated transport system

It was agreed that ITS should be used or developed on wider networks. It was also determined that the technical committee has specific responsibility to countries in transition and proposed to arrange a seminar on ITS in one of them (South Africa).

### 3. PUBLICATIONS

#### 3.1. Special Edition of Routes Magazine (September 2005)

A special edition of the Routes magazine on the theme of ITS(No. 328) was prepared to coincide with the launch of the 2<sup>nd</sup> Edition of the ITS Handbook at the 11<sup>th</sup> World Congress on Intelligent Transport Systems in Nagoya, Japan, October 2004 (see 4.2 below). Members of the committee contributed a number of articles on the subject of Network Operations and ITS. These included “ PIARC Road Network Operations Handbook” by Ralph Jones, “Traffic Management in Wales” by Robert Cone, “Intelligent Transport Systems make progress around the Developing World” by John Miles and Janet Walker, “Understanding each other in Intelligent Transport Systems: An introduction to ITS terminology” by Martial Chevreuil, “e-Transport: Smart Solutions for New World Economies” by Alex Van Niekerk, “The Development of a National Road Traffic Information Policy in France” by Marie Thérèse Goux and “System for measuring speed on road sections” by Jesus Diez de Ulzurrun.

#### 3.2. Publication of the 2nd Edition of the PIARC Intelligent Transport Systems Handbook

A revision of the PIARC ITS Handbook was prepared by the editors with supervision and guidance from C.16, the predecessor committee to TC1.4 in the 2001-2003 cycle. Publication of the English edition was arranged through Route 2 Market, and after some delay the new volume appeared in 2005. The layout and design makes use of photographs and colour and is more attractive than the traditional style of PIARC Technical report. There is also an on-line version of the ITS Handbook marketed for a fee ( [www.itshandbook.com](http://www.itshandbook.com) ). These are good quality references which could be used as textbooks for transport students, but pricing and marketing are not well tuned to that market. Some market research is needed.

Translation of the 2<sup>nd</sup> Edition into French was co-ordinated by Sandra Sultana, chair of C16, the predecessor committee from the 2001-2003 cycle, and Martial Chevreuil, Director of the ITS Technical and Scientific Centre, ISIS Consultants, France. The work was completed in 2006 with resources provided by the French Ministry of Transport and the Ministry of Transport of the Government of Quebec, Canada. Commercial sponsorship for publication of the French Edition was secured from V-Trafic / Mediamobile and ISIS Groupe Egis, France.

In order to enlarge the audience of the ITS Handbook, a contract was signed in October 2006 between the PIARC General Secretary and Mr. Wang Xiaojing, who is Director of the ITS Centre of China and with China Communications Press for the translation and printing of the Chinese version of the PIARC ITS Handbook second edition with completion within one year.

### 3.3. TC 1.4 Website / CD-ROM

Writing a good technical report and achieving consensus in committee is difficult and time consuming. C.16 set a very high standard. Writing technical reports this standard requires a sustained input and involves a lot of editorial work. In practice the active membership was heavily committed between meetings and PIARC activities were often of low priority. Therefore the task of drafting papers and preparing reports fell to a handful of enthusiastic members who did it in spare time, or who could delegate to junior staff.

With these limitations in mind we decided that the most useful contribution the committee could make would be:

1. To provide accessible guidance and case studies on wide-area network operations, information management and evaluation of ITS for professional development and training purposes
2. To provide additional guidance and case studies targeted at developing countries and countries with economies in transition

The concept of a website or CD-ROM as the main deliverable from TC1.4 was developed during the 2<sup>nd</sup> and 3<sup>rd</sup> meetings of the committee in response to a debate about the value of the committee's work and the importance of training and outreach. The concept is a website or stand-alone CD-ROM dedicated to Network Operations and populated with relevant papers and documents. This CDROM provides a comprehensive coverage of road network operations as a complement to the PIARC ITS Handbook (2<sup>nd</sup> Edition, published 2004).

The audience for the CDROM was seen as:

- Policy makers, transport planners
- Transport professionals
- Freight and public transport operators
- Consultants
- Academia
- Automotive industry, motoring organizations

#### Contents

- Introductory texts from the Committee
- Technical briefings and Case studies
- Presentations on network operation activities
- Relevant reports and other key documents

This provides an introduction to the whole topic of road network operations and its component activities. In this context, "network operation" means operation in the widest sense, including the integration of these activities:

- Across geographical boundaries between road operators and road administrations
- Allowing travellers and freight forwarders the optimized use of all modes of transport
- Facilitating intermodal transfer and smooth access to ferry-terminals, ports, airports, road-rail transfer points, etc.

The institutional issues of network operation are significant because of the number of stakeholders involved. The provision of accurate and timely information to all the interested parties has a central role.

After consultation with the PIARC secretariat, it was agreed that the TC1.4 technical report should be produced as an interactive CD-ROM which could be produced at low cost, or made available on the Internet as an interactive web site. We were fortunate that one of the UK members, National Assembly for Wales, was able to make available generous technical support and sponsorship to help the committee achieve this publication goal.

Development of the CD-ROM was subject to the following rules:

- The work of TC 1.4 remains the sole property of PIARC which will retain responsibility for its dissemination after completion of the build-up period.
- Development of the CD-ROM on the Welsh Assembly Government web had to abide a number of technical rules, to be provided by the PIARC Secretariat.
- The CDROM main text was produced in the two official languages of PIARC, French and English.
- The PIARC Secretariat provided guidelines for the lay-out and visual appearance to confirm the PIARC branding. Use of the sponsor's "Traffic Wales" logo and mention of Welsh Assembly Government sponsorship was confirmed, provided there was no confusion over the origin of the CD-ROM.

The CD-ROM handbook is organised within a logical structure of themes and topics. Each topic has an introductory text written by the committee. Indexing and navigation menus are available in English and French. Clicking on the menu subject headings takes the user to short papers on each topic with hyperlinks to longer documents.

The CD-ROM is being published and distributed by the PIARC Secretariat in accordance with their normal practice. In addition, we recommend that the table of contents and introductory texts are brought together for printing as a PIARC Technical Report, to be printed and published in the normal way.

## 4. SEMINARS AND TRAINING WORKSHOPS

### 4.1. “eMobility” Conference 2005, Cape Town, South Africa

Countries with so-called “new world economies” face transport challenges that are somewhat different from those in highly industrialised countries. “New world economies” refer to countries that are in transition and typically experience challenges such as fast urbanisation, growing populations and a need to expand its transport infrastructure. New World countries have transport priorities somewhat different from industrialised nations with established infrastructure that often have legacy systems in place.

The benefits that ITS technologies can offer to leverage resources and provide innovative solutions were the focus of the 3rd South African Society for ITS (SASITS) International Conference and Exhibition. It was held on 10 – 13 May 2005 at the Cape Town International Conference Centre, South Africa. Titled e-Transport: Smart Solutions for New World Economies, this event brought together local and international experts and systems, while best practice products and services were on show at the exhibition.

The key objectives were:

- To promote ITS as a tool to promote safer and more efficient and user-friendly transport;
- To provide a high profile platform to showcase ITS achievements, especially in New World Economies
- To strengthen international ties in general, and between New World Economies with similar challenges in particular
- To explore New World Economy ITS opportunities
- To showcase cutting edge technologies from which new world economies can benefit.
- To transfer knowledge to especially students, who will be responsible for the future implementation of ITS

#### Training sessions

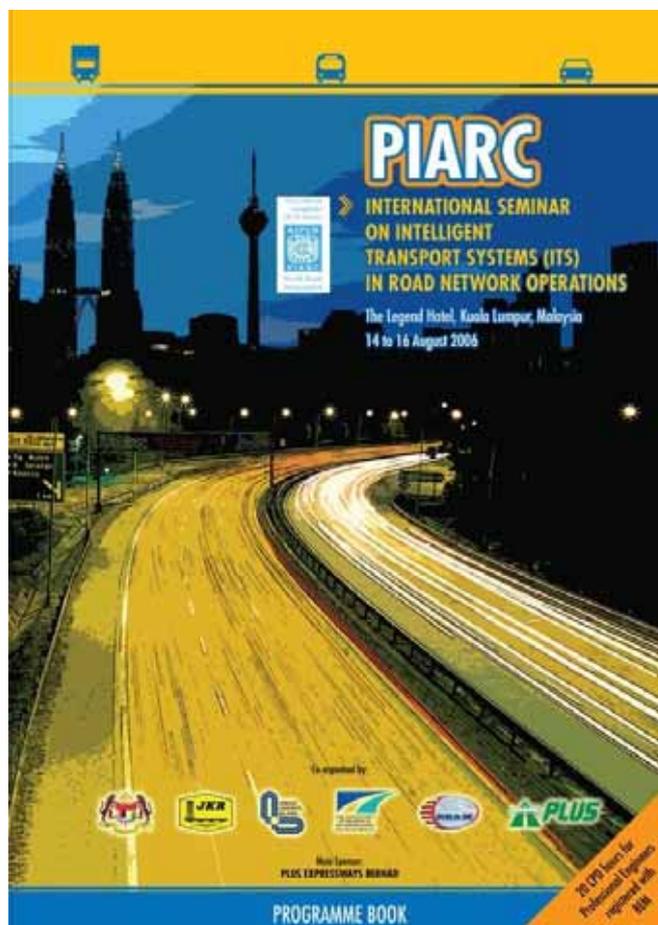
On the last morning of the conference members of TC1-4 presented a training course at the conference with respect to the contents of the PIARC ITS handbook. The purpose of the training session was mainly to transfer knowledge to the ITS implementers of the future. For this reason, pre- and postgraduate civil engineering students from the University of Cape Town were invited to attend the last day and training session at the conference, free of charge.

The contents of the training session included topics such as “what are ITS?”, “what can it do?”, “ITS in transitional countries”, and the concept of “road network operations”. Various case studies, especially with respect to road/congestion pricing were used to demonstrate the principles and advantages of ITS.

Students and professional engineers shared in the proceedings through video conferencing at the University of Pretoria, about 2000 km from Cape Town. In total, approximately 60 persons received training. If the active participation and enthusiasm of the students were an indication of the future of ITS in South Africa, the future of ITS looks very positive.

At the TC1-4 technical meeting that was held after the conference, conclusions that were drawn from the conference were discussed with Board members of SASITS. The importance of technology transfer to new world economies was highlighted. Both the PIARC members, as well as the SASITS Board of Directors agreed that the training session was successful, and should be repeated in other countries in transition.

#### 4.2. International Seminar in Kuala Lumpur, Malaysia, 14-16 August,



#### Format

The Seminar in Kuala Lumpur provided an insight on current best practices internationally with respected to the utilization of intelligent Transport System (ITS) in road network operations as part of an integrated Transport System. The event serves as a benchmark for future development of ITS usage in network operations within the S.E. Asia region. The Seminar was held over three days and comprised four Technical Sessions, a Forum and Field trip:

- Two (2) days for the Technical Session and Forum
- One (1) day for Field Trip

An exhibition was held in conjunction with the Seminar.

There were four technical Sessions with more than 15 Technical Papers to be presented:

Technical Session 1 - New Ideas For Network Operations

Technical Session 2 - Information Management And The Public Interest

Technical Session 3 - Appropriate Use Of ITS For An Integrated Transport System

Technical Session 4 - Challenges In Implementing ITS

Each technical session has been presided over by a chairperson. The speakers have presented their papers based on the session topic, followed by a Panel Discussion/Question & Answer session. The chairperson has summarized the main conclusions at the end of each session.

For more in-depth discussions, a Forum was followed on from the four Technical sessions. The topic of the Forum will be "ETC: Experience and Lessons Learned". Dr John C Miles, the Chairman of PIARC TC 1.4 with moderate the discussion and summarized the proceedings at the end of the session.

The Field Trip provided participants with an overview of the current usage of intelligent Transport Systems (ITS) in network operations in Malaysia (Kuala Lumpur Integrated Transport Information System, Malaysian Highway Authority Management Centre, PLUS Expressway Regional Communications Centre and SPRINT Highway Lebuhraya Damansara-Puchong Traffic Control and Surveillance System) as well as an insight in to the country (Putrajaya, Cyberjaya and Karyaneka Handicraft Centre).

#### Participants

	<b>Total</b>
<b>Local</b>	422
<b>Foreign</b>	35
<b>Total</b>	457

#### Training Session

- ITS Handbook – Dr. John C Miles and Robert Cone, *United Kingdom*
- Modelling and Simulation in ITS – basic and sample applications – Dr Andreas Rau, *Germany*.
- ITS Benefits and Introduction to IBEG – Patty del Pozo, *United States of America*

<b>Category</b>	<b>Participants</b>
University lecturers	13
University student	15
Representatives from government Agencies / PLUS	21

## Seminar conclusions

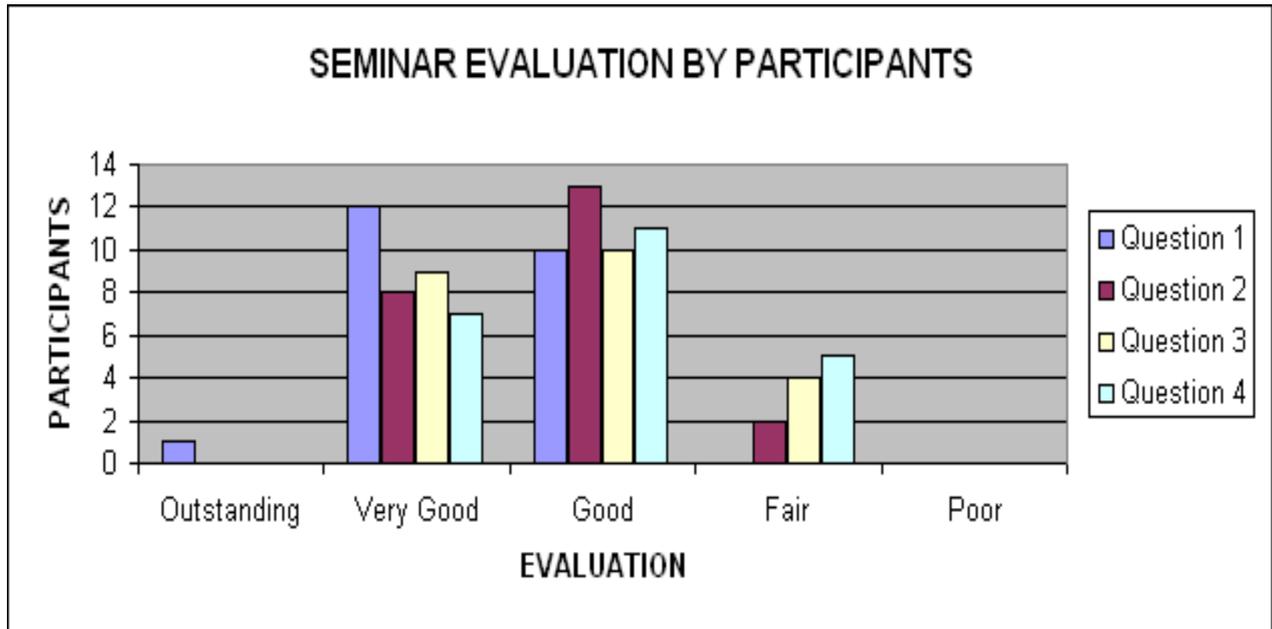
The technical conclusions derived from the series of discussion held over the 3 day conference are as follows:

1. An International Standards of Practice to be established for ITS to regulate worldwide ITS practices and approaches.
2. Planning of ITS projects to give due consideration for regional collaboration and integration between key agencies and integration between regional multi-jurisdictional traffic management systems.
3. ITS to play a more important role in road safety and achieving KPI's to meet customer satisfaction.
4. PIARC to work towards ensuring better participation from under-developed and developing countries at future seminars and conferences (non-technical comment).
5. The application of ITS in Electronic Toll Collection (ETC) is changing rapidly with the latest being the Multi Lane Free Flow (MLFF) system. Implementers and policy makers must take necessary steps to ensure that systems in place are of the latest technology and do not become obsolete over a short period of time after its implementation.

## Evaluation

The feedback obtained by the random survey from the participants in regards to the first four questionnaires is as follows:

No.	Question	Outstanding	Very Good	Good	Fair	Poor
1	What is your overall impression of the seminar?	1	12	10		
2	What do you think of the methodology (presentation, group work, forums etc.) used in seminar?		8	13	2	
3	What do you think of the quality of the presentations?		9	10	4	
4	What do you think of the quality of the discussions?		7	11	5	



4.3. International Seminar in Santiago, Chile, 11- 13 April 2007



At the time of writing this report this International Seminar on the theme “Road Network Operation Management (ITS) and Road Safety”, is still about to take place. The seminar is directed at persons or organizations related to the area of Highway Infrastructure Design, Construction and Development, Road Networks, Intelligent Technology Systems (ITS) and Road Safety and will provide an unique opportunity for the exchange of ideas and experiences in those areas. Meetings of PIARC TC1.4 and TC3.1, respectively “Network Operations and “Road Safety” will take place simultaneously with the Seminar. The intention is to provide a venue for the expression and exchange of experiences, ideas, management methods and new technologies developed to achieve improvements in the design, construction, operation, development and safety of road networks.

## 5. OTHER EVENTS AND ACTIVITIES

### 5.1. ITS IBEC Group (International Benefits, Evaluation and Costs)

IBEC is a cooperative working group set up to coordinate and expand international efforts, to exchange information and techniques, and evaluate benefits and costs of ITS (see [www.ibec-its.org](http://www.ibec-its.org)). The IBEC mission is therefore of great relevance to the 3<sup>rd</sup> strategic theme for TC1.4, which is the appropriate use of ITS for an integrated transport system. TC1.4 contacts with the IBEC group was maintained through Richard Harris and Martial Chevreuil leading to a valuable exchange of documents. Patty del Pozo from the IBEC group (ITS America) assisted TC1.4 in the training session at the Kuala Lumpur seminar. TC1.4 members will combine with the IBEC group in arranging training on ITS on behalf of the World Bank in Beijing, China, to coincide with the 14<sup>th</sup> ITS World Congress, October 2007.

### 5.2. ITS America

A joint meeting with the ITS America group on research and training took place at the second meeting in Nagoya which looked at the role of university staff in ITS development, evaluation and training of new ITS specialists for the future. In addition, ITS America supported with the Training Session in Malaysia, as reported above.

### 5.3. Memorandum of Understanding with FISITA

During 2006, as a result of the International Seminar in Kuala Lumpur, TC1.4 established contact with FISITA, the International Federation of Automotive Engineering Societies, the world body for automotive engineers and a non-profit educational and scientific organisation. FISITA works with its member societies and the automotive industry to:

- Promote advances in automotive technology which save lives, protect our environment and conserve natural resources
- Disseminate and share leading-edge technical knowledge between nations
- Facilitate practical cooperation among the automotive engineering societies in different countries
- Support the continuing professional development of automotive engineers
- Encourage the education & training of students and young engineers
- Communicate the positive contribution of automotive engineers to society

A draft MOU between PIARC and FISITA is now under consideration which would, inter alia, lead to the promotion of each other's congresses, publications and other activities of mutual interest including calls for papers, conference programmes, student programmes, web links etc. In order to strengthen the links, a representative of FISITA, Martin Rowell, has been co-opted onto TC1.4. FISITA has been invited to provide two keynote speakers for Strategic Session SS16 "Technical Advances" at the 23<sup>rd</sup> World Road Congress Paris, on 18 September, 2007.

#### 5.4. Internet-based communications

TC1-4 experimented with use of web meetings over the Internet (1) for a technical discussion on traffic detection technologies; and (2) to prepare for a PIARC international seminar which will be held in Malaysia in August 2006 to link members in UK, Belgium, Australia and Japan with the local organising committee. We have been very pleased with the results. But even with using these facilities it was difficult to get participation from all but the most active and committed members. Arranging the web conference at a time which works well and is convenient across different time zones is of itself a challenge.

There are now a number of commercial providers of these Internet-based web meeting services (e.g. "Webex"). It needs some training and rehearsal in using the software but once mastered is a very powerful and effective way of keeping in touch between meetings. One member has to host the web meeting and pay for the Webex service; other participants need a broadband internet connection and access plus an international telephone line for the voice link, so may be unsuitable for some developing countries.

#### 5.5. TC1.4 Input to PIARC Strategic plan 2008-2011

The following response was provided to the questionnaire in preparation for the PIARC Strategic Plan for 2008-2010 following discussion by TC1.4 members at the 6<sup>th</sup> meeting in Amsterdam 3-6 April 2006

- What do you consider to be the THREE priority issues which will be critical in the future in your Committee's general topic area? Please provide background information to clarify your response.

##### 1. Outreach and Education

The current work of TC1.4 is a development of the work of the former committee C.16 over the past two PIARC cycles, 1996-1999 and 2000-2003 . C.16 developed the PIARC ITS Handbook (1<sup>st</sup> Edition 1999, 2<sup>nd</sup> Edition 2005) and the Road Network Operations Handbook (2003). TC1.4 is currently involved in gathering case studies that can augment and illustrate these two reports.

The combination of C16/TC1.4 deliverables provide a rich resource for outreach and education aimed at students and young professionals through workshops, seminars and training sessions. We recommend that outreach and training in network operations is built in to the next strategic plan in order to maximise the benefit of PIARC committee work over the past decade.

##### 2. Network Operations Policy and Practice

This is a continuation of the current theme "New methods in Network Operations".

- ❖ Integration of road network operations across regional and international boundaries, specifically:
  1. Managing the operational, jurisdictional and other administrative interfaces
  2. Inter-modal operations at international airports, ferry terminals and ports
  3. Management of cross-border road-freight and transit traffic
- ❖ Further case studies of new approaches to Network Operations, for example:
  - Interface of network operations with other major stakeholders: commercial vehicle fleet operators, servicing of local markets, city transport, just-in-time deliveries, etc

- Accommodating the increased need for maintenance of the road infrastructure
- Bringing capital investment and asset management of the network together with network operations
- Strategic planning and modelling for network operations purposes
- Good practice on peak-spreading and demand management
- Role of ITS and new technologies in network operations
- Security of network operations
- Opportunities for co-operative vehicle-highway systems

### 3. Benefits and Evaluation in Network Operations

Roads authorities are required to justify their budgets for network operations against a background of growing traffic demands and increased public and stakeholder expectations. This is in the context of increasingly scarce public funding. Established evaluation and assessment methods need examining from a network operations perspective. The issues differ from those involved in justifying capital investment in roads infrastructure. They include.

1. Methodology for ante- and post-evaluation of new methods of network operations (ITS tools and systems)
2. Effective inter-agency working: partnerships and contracts between the roads authorities and other stakeholders in network operations
3. Risk assessment in network operations, including inter-agency working, corridor management, operating frameworks and contingency plans
4. Evaluation of the impact of personal and in-vehicle telematics, information and communications devices on network operations
5. Cost-effective procurement of ITS projects and systems

➤ Would the field of competence for your Technical Committee need enlarging or changing in order to address your proposed future priorities?

Yes:

- a. Greater involvement of private sector stakeholders in network operations is needed either as active committee members, co-opted expert advisers or invited on an ad hoc basis to help TC members on specific agenda topics.
- b. Need to find active committee members or expert advisers who can assist the committee with first-hand knowledge of network operations in developing countries and countries with economies in transition.

➤ What do you consider should be addressed as PIARC Strategic Themes in the next cycle?

- c. Outreach to young transport professionals and students in developing countries and countries with economies in transition.
- d. The big picture: Transport futures: mega-cities, the environment, sustainability and energy (link TC1.4 with TC2.3?)

## 6. CONCLUSIONS

### 6.1. Participation

The expertise of the active committee members was relatively well balanced to address the work programme. The programme was carried through by the dedicated efforts of the active members. Most of the active members were officials from road administrations plus a few from the private sector (road concession-holders or transportation consultants). This mix of public and private was very helpful. Also we covered small and big countries. However, we noted a general issue of how to capture the expertise and maintain interest in the subject of road network operations among the wider group of stakeholders in network operations and gain their input.

A significant proportion of the membership did not attend meetings and there was little input from corresponding members. Also note that this was a committee that worked primarily in English. There were relatively few active French-speaking members and no Spanish speaking members attended meetings, with the exception of Santiago, Chile.

We need to find better ways of bringing in sleeping partners. Most of the work falls to a handful of productive members. For example, there is some very good experience now of using the Internet and the World-Wide Web to strengthen networking between professionals internationally. However it would require the committees to have training and support in hosting and animating web-based discussions.

Poor participation by developing countries and countries with economies in transition was also a handicap in delivering the brief for two reasons:

- Because few members from developing countries participated in meetings we lacked first-hand knowledge of the problems and issues.
- Lack of continuity: delegates from developing countries did come to one or two meetings but could not appear again.

Recommendations:

- Hold more TC meetings in developing countries on themes and topics that are relevant to these countries and invite local participation.
- When meeting in a developing country include a half-day workshop, seminar or training session as part of the meeting. Invite local participation. TC1.4 did this in Cape Town, South Africa. This allows the TC members to share their expertise and learn about the local problems.
- Address a lack of resources for travel for developing country delegates so they can attend more frequently.
- Understand and plan for the administrative obstacles for delegates from these countries.
- Allocate responsibilities in the committee for communication and encourage communication with the members who are inactive or unable to attend (email correspondence, phone calls, promoting the web site).
- Make full use of email, web conferencing and the Internet to maintain contact with members.

## 6.2. Publications

We would like to see PIARC develop guidelines for securing commercial sponsorship of PIARC reports. There are no specific resources allocated centrally for drafting and editing a technical report to achieve a quality product like the ITS Handbook. Some form of sponsorship seems to be the only answer. Some members give their time generously but final responsibility falls to the committee Chair to manage the project.

## 6.3. Outreach

With regard to outreach, the half-day training session we did for 50 students (final year and postgraduate Civil Engineering) in Cape Town was a great success and it felt the committee had a real purpose. The strong involvement of a local organising committee was essential to this success. (PIARC members in South Africa through the South Africa Society for Intelligent Transport Systems)

Real needs have been “discovered”. We are now much clearer about the audience for our work. Success of our Malaysia seminar in August 2006 was a crucial test of our effectiveness, but again the responsibility to deliver falls heavily on the committee chair, supported by a relatively small group of dedicated members.

The target of 2x 3-day international seminars from each committee is very ambitious. Each seminar is a considerable challenge, along with the other committee tasks of producing Technical Reports, etc. We recommend adopting a less ambitious form of outreach based on the model of ½ day or 1 day training seminars for students and stakeholders within the country hosting a committee meeting.

## 6.4. Stakeholders in Network Operations

There are many different groups of stakeholders involved in network operations, directly and indirectly: toll road operators, traffic police, emergency services, travel news broadcasters and publishers, commercial fleet owners and operators, etc. A general issue is how to foster and maintain interest for the subject among these stakeholders and tap their expertise.

The PIARC policy is to ask the First delegate of each country to appoint an expert of the domain to the committee. Specific stakeholders (large cities, manufacturers, system integrators, police ...) have few chances to participate directly to the TC meetings. To augment the committee’s expertise we included to one or two speakers from these stakeholder groups in our workshop sessions, by invitation of the chair.

We suggest the practice of inviting representatives of key stakeholder groups to join the committee for presentations and exchange of views could be a standard feature of the meetings in future. The countries hosting the committee meeting can organize presentations of case studies by national stakeholders.

## 6.5. PIARC Business model

The long-established business model for the work of the PIARC technical committees has become out-dated and unfortunately is no longer sustainable. Public authorities have become much more cost-conscious (at least in the UK). Non-essential activities, such as participation in PIARC, come under close scrutiny. They need to be able to justify their participation in PIARC to their own supervisory committees and those who control the budget. They struggle to devote staff time to committee work and for funding the long-distance travel involved in attending meetings. They need clarity on the focus of PIARC's mission and information on the effectiveness of PIARC's work to do this. They need to demonstrate the benefits of participation.

Individual committee members themselves are under pressure too, and have little or no time to devote committee work between meetings. Responsibility for the committee's output therefore falls disproportionately onto a handful of well-motivated individuals who often do it in spare-time. Furthermore, the committee itself often suffers by not having ready access to specialist advice, which affects the quality of the reports. For example TC1.4 needs specialist advice on ITS and on the methodology for benefits evaluation and costs analysis. Handbooks, such as those produced by C.16 committee, although based on the work of the committee, require heavy technical editing, which does not come for free. Innovative communications methods of the kind pioneered by TC1.4 also need specialist support. To perform at this level the committees need their own resources. Some form of funding or sponsorship, in cash and/or in kind, and most likely to include sponsorship opportunities for private and commercial organisations, is needed for PIARC to continue. It is felt this could be done openly and transparently, in ways that will not compromise the independence and authority of PIARC on the world scene.

## **BIBLIOGRAPHICAL REFERENCES**

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- PIARC ITS Handbook Second Edition in English, ISBN 2-84060-174-5, and online at <http://www.itshandbook.org/>.
- PIARC ITS Handbook Second Edition in French ISBN 2-84060-188-5

# **STRATEGIC THEME 2 SUSTAINABLE MOBILITY**

## **ACTIVITY REPORT 2004-2007**

Wolfgang Hahn (Germany)  
ST2 Coordinator

### **Goal**

Encourage the development of road transport policies and programmes that result in beneficial community outcomes for sustainable and safe mobility in economic, environmental and social terms, and take full account of the need for integration with other transport modes.

### **Overview**

The scope of the work for Strategic Theme 2 brings together the themes of sustainability and integration of different transport modes across the scale of roads in rural and urban areas in developed and developing countries and those in transition. Particular attention is paid to extreme situations of mega cities and rural isolated communities.

Balancing the demands of environmental management and development pressures to achieve sustainable and beneficial community outcomes, taking account of the needs of people for mobility and the economic imperative of moving goods efficiently and effectively, is a growing concern that is addressed in the strategies and work programs of the Technical Committees in Strategic Theme 2.

The work has to be carried out in cooperation with international funding institutions, the joint OECD/ECMT transport research centre and pan country groups and organisations dealing with sustainable development for transport issues.

### **Technical Committees**

- TC 2.1 Sustainable Development and Road Transport
- TC 2.2 Interurban Roads and Integrated Interurban Transport
- TC 2.3 Urban Areas and Integrated Urban Transport
- TC 2.4 Freight Transport and Inter Modality
- TC 2.5 Rural Roads and Accessibility

**Meetings** of the Strategic Theme Technical Committee Chairs took place at the following venues:

Birmingham, 10 June 2005, chaired by Ms. Ginny Clarke,  
Berlin, 6 June 2006, chaired by Mr. Wolfgang Hahn,  
Bonn, 13 June 2007, chaired by Mr. Wolfgang Hahn.

## **Activity Reports**

### **TC 2.1 Sustainable Development and Road Transport-Chair: Anders Jansson**

The purpose on this committee has been to investigate how the consideration of sustainability is the route to achieving enhanced transport solutions that address problems and deliver society objectives in the social, environmental and economic dimensions.

The committee's work has addressed the challenges of delivering socially and environmentally acceptable solutions, whilst recognising the inescapable funding issues which must be considered and managed.

Since 2004 the issues which the committee have pursued are:

1. Concrete application of policies, such as those developed in the Kyoto Protocol and Rio conference, to road transport.
2. Funding levels need to be identified to inform future planning and understanding of the commitment to environmental mitigation.
3. Mitigation of environmental impacts of road transport.

In 2006 the Committee adopted the following three reports:

1. Comment appliquer les concepts du développement durable aux transports?
2. Focused funding,
3. Social and environmental approaches to sustainable transport infrastructure.

### **TC 2.2 Interurban Roads and Integrated Interurban Transport-Chair: Jean-Michel Gambard**

The main work is presented through one Committee report: Interurban Roads for today and tomorrow. The report aims to assist with improving sustainability by providing a pool of best practice and advice drawn from experience around the world. The focus is on better planning and how to get the most out of the existing infrastructure.

Trends and predictions for the future are identified along with recommendations on how to adapt to these changes. Client-oriented transport planning can integrate the various needs of clients and society. A multi-stage principle is suggested as a general approach to develop the road transport system rather than a strict planning model.

### **TC 2.3 Urban Areas and Integrated Urban Transport-Chair: Csaba Koren**

The following reports were published:

1. Introductory report including the main findings of the work of the Committee.
2. Technical report on "Human powered mobility" (facilities for bicycles and pedestrians).
3. Technical report on "Sustainable transport in mega-cities"
4. Technical report on "Congestion and its countermeasures"

### **TC 2.4 Freight Transport and Inter Modality-Chair: Eiichi Taniguchi**

Two reports of the committee have been published concerning the previous cycle work programme (2000-2003):

1. Vehicle Size and Weight Limits – Experiences and trends
2. Freight modal split

For the cycle 2004-2007, three reports should be published:

1. Freight transport and intermodality: Measures promoting alternatives to the road and intermodal terminals (2007)
2. Mitigation of negative impacts of increased movement of freight
3. Guidance for the developing countries to building a sustainable freight transport system

### **TC 2.5 Rural Roads and Accessibility-Chair: Jean-Francois Corté**

Work and outputs have been redefined as follows:

1. Socio-economic-indicators

A survey was launched among different countries in order to know how the needs for rural roads are being appraised and which are the indicators used to characterize the need for accessibility in rural areas. The results will be presented during the committee session at the World road congress in Paris.

2. Design of rural roads

The committee has done a search and an analysis of the Internet websites dealing with design, construction and maintenance of rural roads. A tool to facilitate the search of information has been defined; it should be implemented on PIARC Internet website.

In addition, the Technical Committee has reviewed and made some suggestions for finalizing the Technical guide on Low cost surfacings prepared by R. Petts as a study financed by DFID.

3. Planning and management of rural roads

From the outputs of three seminars organized with the committee, the committee identified a set of cases of best practice in terms of planning and management of rural roads.

## **STRATEGIC THEME 2**

### **TECHNICAL COMMITTEE ON SUSTAINABLE DEVELOPMENT AND ROAD TRANSPORT (C2.1)**

#### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

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Simon Price, United Kingdom  
Jean-Francois Langumier, France  
Pierre Skriabine, France  
Gloria Shepherd, United States of America  
Alexander Walcher, Austria  
Martin Buck, Switzerland  
Fabienne Beaudu, France  
Felix Huber, Germany  
Björn Iuell, Norway  
Ole Kirk, Denmark  
Hirofumi Ohnishi, Japan  
Lisa Rossiter, New Zealand  
Cecilia Olague, Mexico  
Andy Southern, United Kingdom  
Friedrich Zotter, Austria

## **1. INTRODUCTION**

This PIARC Activity Report is to present an overview of PIARC activities for 2004-2007. Within the strategic theme of Sustainable Mobility, the task of technical committee 2.1 was to consider the whole relationship between road transport and sustainable development.

Historically the development of transport solutions has focussed primarily on the resolution of transport problems. Other issues of a social and environmental context have often been addressed as a consequence rather than a prime driver.

Our purpose on this committee has been to investigate how the consideration of sustainability is the route to achieving enhanced transport solutions that address problems and deliver society objectives in the social, environmental and economic dimensions. The committee's work has addressed the challenges of delivering socially and environmentally acceptable solutions, whilst recognising the inescapable funding issues which must be considered and managed. Issues such as community impact assessment and impacts in urban areas together with a wide ranging analysis practice in handling environmental challenges have been looked at.

## **2. ACTIVITIES IN 2004**

The first meeting of the Committee for this period was held in Paris, April 18-22, 2004. Chaired by Anders HH Jansson, the committee designated secretaries (English Simon Price, French Jean-Francois Langumier) and liaison members (Spanish Marie Laure Jimenez, PIARC web site Pierre Skriabine, terminology Gloria Shepherd, TED Anders HH Jansson). A preliminary working group structure and schedule was defined for the three issues of the Committee, as well as a preliminary schedule of meetings and seminars.

The second meeting was held in Cracow, 15-16.11.2004. At this meeting, the working group structure, actions and agenda were decided. The programs for the WGs was finalised in December 2004. The issues and actions which the committee have pursued from this point on are:

### 2.1. Issue 2.1.1

Concrete application of policies, such as those developed in the Kyoto Protocol and Rio conference, to road transport (WG leader Pierre Skriabine).

- How have the concepts of sustainable development been applied in the transport policies of different countries?
- Decision-making for sustainable development in the road sector.

This action has been led by Pierre Skriabine and the other committee members supporting this action are shown in Annex 2.

### 2.2. Issue 2.1.2

Funding levels need to be identified to inform future planning and understanding of the commitment to environmental mitigation (WG leaders Alexander Walcher and Gloria Shepherd).

- Corporate Social Responsibility in the road sector.
- Focused Funding.

The CSR action has been led by Alexander Walcher and the action on focused funding led by Gloria Shepherd. Other members supporting these actions are shown in Annex 2

### 2.3. Issue 2.1.3

Mitigation of environmental impacts of road transport.

- Soil and water pollution.
- The priorities of environmental mitigation.
- Social and community impact assessment.

This action was led by Anders HH Jansson supported by members as shown in Annex 2.

In conjunction with the meeting the committee also attended and supported the “Surface water, underground water and soil protection along roads and motorways” conference which was held in Krzyzowa, Poland 17-19.11.2004. This conference was directly relevant to the committee's consideration under Issue 2.1.3. The conference was arranged by the Polish road authorities and the Committee, under the auspices of PIARC and the AIH. It was chaired by the TC member Mr Tomas Zapasnik. Out of the 19 presentations made, 7 were by committee members or experts invited by the Committee.

The conclusions of the conference, directed especially at economies in transition, have been presented for publication. In addition in this period an article on evaluating environmental management (issue 2.1.1), by Mr Jansson, was published in Routes 1/2005.

### 3. ACTIVITIES IN 2005

In 2005 the committee began in earnest to address the prescribed issues following a variety of methodological approaches.

3.1. Issue 2.1.1 Concrete application of policies, such as those developed in the Kyoto protocol and Rio conference to road transport.

Action 1 How have the concepts of sustainable development been applied in the transport policies of different countries.

This action was progressed through a call for case studies. Importantly for the validity of this work, members were successful in using their wide range of contacts to provide case studies from other countries. For example case studies from Mozambique, Angola, Cape Verde, Guinea and Iran were received.

3.2. Issue 2.1.2 Funding levels need to be identified to inform future planning and understanding of the commitment to environmental mitigation.

Action 1 Corporate Social Responsibility in the Road Sector.

A survey questionnaire to establish the presence of CSR or its constituent building blocks within organisations was designed by the working group (WG) and was firstly circulated among WG members as a pilot to test its effectiveness before being given wider circulation. In recognition of the relative unfamiliarity with the CSR term in many countries a 'buddy' system was adopted by the WG to help elicit replies from as widely as possible.

Action 2 Focused funding

This work was to explore the relationship between objective setting at the programme level and to investigate if this done sufficiently to ensure that adequate funds are identified to protect delivery at the project level. Or, is there an over reliance on the mitigation of adverse impacts.

A survey was distributed. Again the WG used the 'buddy' system to elicit a more comprehensive response and to help with the interpretation of the survey questions.

### 3.3. Issue 2.1.3 Mitigation of the Environmental impact of road transport.

#### Action 1 Soil and Water Pollution

This action was implemented by the committee's role in the conference "Surface water underground water and soil protection along roads and motorways".

#### Action 2 The priorities of environmental mitigation

This action was to examine what needs to be done at different levels to attain the goal of sustainability.

- At the strategic/planning level a draft essay was produced entitled 'Best practices for taking account of sustainability in road planning'.
- At the planning/project level a condensed version of the COST 341 handbook but targeting developing countries and economies in transition was considered.
- And for the project implementation level a report on the mitigation for an example motorway scheme.

A survey for information relating to all of the above was carried out.

#### Action 3 Social and Community Impact Assessment.

This action examined what influence social and community effects have on transport planning decisions and how these are assessed. A survey and request for case studies/assessment materials was made.

#### 4. ACTIVITIES IN 2006

The first meeting of the Committee for this period was held in Monterrey in the state of Nuevo Leon, Mexico from 10 to 11 May 2006, at the invitation of the Asociacion Mexicana de Ingenieria de Vias Terrestres A.C (AMIVTAC). 13 members were able to attend.

The Committee meeting was preceded by the committee attending an International Seminar on Sustainable Roads, 8-9 May, arranged by AMIVTAC and the Committee. At this meeting, a number of committee members presented papers.

The Committee considered that the seminar was a great success but in discussion developed some reflections on how the approach to seminars might be managed in the future to address the challenge of providing opportunities for improved interactions.

Of direct immediate benefit was the powerful presentation of committee member for Mexico, Snra Cecilia Olague, regarding a case study of land use and transport planning in the city of Chihuahua. This proved to be an extremely good practical illustration of many of the issues that the committee has been developing in its work.

The committee developed its response to the PIARC Strategy inquiry, emphasising that sustainability is a core issue for the whole of PIARC and all of its Committees. In developing the strategy, we need to remind ourselves of this. The committee felt that at present, this aspect is not totally successfully expressed within Committee and Congress practice.

The second meeting of 2006 was held in Florida, USA, from the 2-3 November 2006, at the invitation of the Federal Highways Administration and the Florida Transportation Department. The primary focus of this meeting was to embark on the final stages of the preparations of the committee's outputs for the Paris Congress.

The Committee adopted the following three reports:

- For issue 2.1.1: Comment appliquer les concepts du développement durable aux transports? editor Pierre Skriabine.
- For issue 2.1.2: Focused funding; Editor Gloria Shepherd.
- For issue 2.1.3: Social and environmental approaches to sustainable transport infrastructure; Editor Martin Buck.

In addition, the Committee accepted the proposal for a report in relation to issue 2.1.2 to deal with Corporate Social Responsibility.

A proposed format for the TC 2.1 session at the congress was derived and subsequently agreed. The theme of the session was agreed as:

"Historically the development of transport solutions has focussed primarily on the resolution of transport problems. Other issues of a social and environmental context have often been addressed as a consequence rather than a prime driver.

The purpose of this session is to illustrate through examples how the proper consideration of sustainability is the route to achieving enhanced transport solutions that address problems and deliver society objectives in the social, environmental and economic dimensions. The session will address head on the challenges of delivering socially and environmentally acceptable solutions whilst recognising the inescapable funding issues which must be considered and managed. Issues such as community impact assessment and impacts in urban areas together with a wide ranging analysis practice in handling environmental challenges will be set out and illustrated through a case study.

The session will conclude with a discussion on how to provide a framework for the governance of sustainability considerations through the application of Corporate Social Responsibility approaches."

The committee's call for papers resulted in 36 for consideration from which the committee chose 7. It is hoped that one of these will be presented during the TC2.1 session.

In addition to the TC 2.1 session the committee will be making a contribution to two special sessions 'Evaluation of Public Policies in the Road sector' and 'Vulnerability of Road Systems to Climate Change'.

## **5. 2007 MEETING**

The final meeting of the committee before the congress is to be held in Shanghai, April 23-26, 2007. This meeting, hosted by Atkins China, is combined with a workshop with local transport and urban planning experts, on "The Challenges of Urban Growth".

## **6. OTHER ACTIVITIES**

A presentation of the committee's actions was published in the Paris Congress Newsletter.

Committee members had a central role in the GDDKIA Poznan seminar on the influence of transport infrastructure on nature, held in September 2006: Björn Luell and Pierre Skriabine were members of the programme committee and Mr Luell was keynote speaker at the seminar.

Mr Simon Price was invited to give the keynote address at the 3rd China Road Sustainable Development Congress – a leading networking platform for high-level decision makers throughout China's road construction and maintenance industry.

Mr Anders HH Jansson was invited to give a presentation on balancing infrastructure network development and the environment at the first IRF Roads and the Environment Conference, held in Geneva, in February 2007.

## **BIBLIOGRAPHICAL REFERENCES**

- Focused Funding Survey. PIARC TC 2.1 Report (to be published).
- How to apply the concepts of sustainable development to transport? PIARC TC 2.1 Report (to be published).
- Social and environmental approaches to sustainable transport infrastructure; PIARC TC 2.1 Report (to be published).

## **STRATEGIC THEME 2**

### **TECHNICAL COMMITTEE ON INTERURBAN ROADS AND INTEGRATED INTERURBAN TRANSPORT (C 2.2)**

#### **2004-2007 ACTIVITY REPORT**

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## COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

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Amund Bolstad, Norway  
Gerard Vuillemin, France  
Juan Carlos Espinosa, Mexico

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John Boender, the Netherlands (co-facilitator)  
Torbjorn Suneson, Sweden (Facilitator WG 2/Issue 2.2.2)  
Rita Piirainen, Finland (co – facilitator)  
Rob Richards, Australia (Contact - Issue 2.2.3)

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### Associate members and others contributing:

Gary Sokolow, USA  
Marit Due Langaas, Norway  
Linda Molenkamp, the Netherlands

## 1. WORK PROGRAMME AND ORGANIZATION

Work programme:

The scope of the work for Strategic Theme 2 brings together the themes of sustainability and integration of different transport modes across the scale of roads in rural and urban areas. The terms of reference for TC2.2 thus set out in the PIARC Strategic Plan identified the committee's three primary issues, strategies for addressing them and required outputs as follows:

Issue 2.2.1 - Sustainable Road Transport as a factor in economic and social development

Strategy: Investigate how in the XXI century inter-urban roads should be designed to better achieve sustainable mobility

Output: Guidance on the wider aspects of design for road administrations to consider

:

Issue 2.2.2 - Interaction between the development of road and integrated transport and regional and land use planning

Strategy: Consider recent changes in road and integrated transport as a result of land use planning

Output: Report on the changes that have occurred and how this can guide the future development of road transport in an integrated system

Issue 2.2.3 - Integration and interoperability of different transport modes in the inter-urban network, to support sustainable mobility

Strategy: Identify the issues that are key to delivering integration and will produce sustainable mobility by seeking the views of operators, governments and customers - Evaluate the success of multi-modal interchanges to support greater integration of roads into the transport system

Output: An explanation of the key issues and how these are being addressed by different countries - case studies to illustrate evaluation of successes.

Organization:

Working Groups:

Two working groups were established to pursue respectively issues 2.2.1 and 2.2.2. Additionally a contact person had the responsibility for material addressing issue 2.2.3.

Some 30 case studies collected from member countries have constituted an important background material for discussions and the final report.

After the inaugural meeting in Paris 2004 there have been 6 Committee meetings before the 2007 Congress:

2004: Budapest, Hungary

2005: Adelaide, Australia and Bari, Italy

2006: Monterrey, Mexico and Brussels, Belgium

2007: Montreal, Canada

Average attendance at Committee meetings has been around 15 members (ca. 40 %) and additionally mostly one or two persons representing Correspondents and/or Associate members. There has been active participation from 3 countries with economies in transition but unfortunately little contact with developing countries.

**Cooperation:**

There was a close cooperation with TC 2.1 and not least with AMIVTAC Mexico (acting also as PIARC National Committee) for the arrangement of the seminar in Monterrey spring 2006.

**ST 2 Coordination:**

TC 2.2 has been represented at the ST 2 meetings in Birmingham (2005), Berlin (2006) and Bonn (2007).

## **2. PRODUCTIONS**

Main Committee outputs/activities has been

- Main Committee Report
- Seminar (Mexico)
- Congress preparations
- Discussions and presentations at meetings
- Technical visits

**2.1. Main report: » interurban roads for today and tomorrow».**

The main discussions and production of the Committee has been summed up in the Committee report:

The report aims to assist with improving sustainability by providing a pool of best practice and advice drawn from experience around the world. Its purpose is to raise awareness of the complex issues, interactions and available solutions that surround the interurban road network. The focus is on better planning and how to get the most out of the existing infrastructure. Trends and predictions for the future are identified along with recommendations on how to adapt to these changes.

The goal of transport planning is to support sustainable community development and the transport system in such a way that people and goods can travel as needed safely and economically. Client-oriented transport planning can integrate the various needs of clients and society in different types of travel environments. The purpose of this type of analysis is to ensure that all the main issues are included, that their links and contradictions are identified, and that the attention is turned from construction of roads to people's everyday mobility needs and the transport needs.

A multi-stage principle is suggested as a general approach to develop the road transport system rather than a strict planning model.

In the first stage, measures are sought which affect land use, traffic and transport needs, and choice of travel mode in order to control traffic growth and its consequences. Greater focus needs to be directed towards creative methods that integrate the technically rational level with the political, strategic level:

Create bridges between the strategic, political level and the technically rational level,

Create a connection between visions, needs and need for and choice of transport mode, efficient use of the existing system, minor improvements and new construction.

Intermodal terminals play a critical role in permitting the most appropriate mode of transport to be used, combining the flexibility of road operations with the line-haul efficiency of rail transport. The integration of transportation modes is an important element of this stage.

In the second stage, measures are sought which enhance the use of the existing road network to keep transport route capacity utilized as fully as possible. In this stage operational and access management will be important considerations:

Operational Management is about using the infrastructure as efficiently as possible. Currently most of this is accomplished through hard wired interventions on the road-side that rely on drivers responding appropriately. The natural extension to this trend is likely to involve taking the means of control into the vehicle.

Access Management is “the systematic control of the location, spacing, design, and operations of driveways, median openings, interchanges, and street connections to a roadway”. Access Management aims to manage and mitigate the relationships of roadway operations and the side impacts through the control, design, and location of the interactions.

In the third stage, minor road improvement measures for solving the problem are studied. This stage comprises investments in the existing transport route network to improve safety or load-bearing capacity.

Only in the fourth stage are new investments and major renovations considered. This stage comprises projects for expanding the transport route network.

Public participation, the coordination of transport planning and land use and spatial planning as well as cooperation between the public sector and private interests needs, is essential trying to affect the demand for road transport.

We recommend our report for further information and recommendation.

## 2.2. Seminar in Monterrey Mexico

Combined with the Committee meeting in Mexico there was also arranged for a seminar – “Sustainable Roads 2006” - with ca. 100 participants. As mentioned this was the result of a cooperation involving TC 2.1, TC 2.2 and not least with a strong support from AMIVTAC Mexico (acting also as PIARC National Committee).

## 2.3. Congress preparations

Preparing this activity report from TC 2.2 as well as contribution to ST 2 activity report. Congress Introductory report and preparations for the TC 2.2 Congress session.

## 2.4. Presentation –Exchange of knowledge

Budapest: (2004):

Mr. Momin on Urban Infrastructure – “flyover projects” in India.

Mr. Saffarzadeh: facts from Iran (70 mill. Inhabitants) on roads and road transport statistics.

Bari (2005):

Mr. Wright: Modernizing the Highway Agency’s Telecommunications infrastructure.

Mr. Boyadjian: on speed control (managing congestion).

Ms. Piirainen: A regional transport system planning process.

Mr. Saffarzadeh: Road access management in Iran.

Monterrey (2006)

Presentations given as part of the seminar.

Brussels (2006):

Mr. Diallo: Information from Mali (ca. 11.7 mill, inhabitants) and its transportation system.

Mr. Verdier: Experiences from “the rolling Road” which is a long distance intermodal freight concept between Luxembourg and the Spanish border putting trailers without tractor and driver on the railway. A special loading system has been designed.

## 2.5. Technical visits

Many meetings have been rounded off with some technical visit.

## **BIBLIOGRAPHICAL REFERENCES**

See lists of case studies in main Committee report.

## **STRATEGIC THEME 2**

### **TECHNICAL COMMITTEE ON URBAN AREAS AND INTEGRATED URBAN TRANSPORT (C2.3)**

#### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS WHO CONTRIBUTED TO THE ACTIVITIES**

Anis Balafrej, Morocco  
Anne Bernard-Gély, France  
Bystrik Bezak, Slovakia  
Cornel Bota, Romania  
Alain Broes, Belgium  
Andre Broto, France  
Giovanni Corona, Italy  
Olav Finne, Norway (working group leader "Congestion")  
Göran Gahm, Sweden  
Jürgen Gerlach, Germany  
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Naohiko Hanabusa, Japan  
Peter Jorritsma, the Netherlands  
Farshid Kamali, United Kingdom  
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Alvaro Jorge da Maia Seco, Portugal  
Craig Simmer, South Africa  
Hillie Talens, The Netherlands (working group leader "Human powered mobility")  
Reijo Teerioja, Finland  
Ted Vincent, Australia (working group leader "Mega-cities")  
Terry Wang, United Kingdom  
Frédy Wittwer, Switzerland  
Takashi Yajima, Japan

## 1. WORK PROGRAMME AND ORGANISATION

### 1.1. Meetings

Taking into account the working rules, the Committee met twice a year according to the following schedule and attendance.

April 20-21, 2004 Cœur de la Défense, Paris, France (15 members)  
October 14-15, 2004, Errera Hotel, Brussels, Belgium (24 members)  
April 21-22, 2005, Hotel Reghina Blue, Timisoara, Romania (20 members)  
October 25-26, 2005, KKR Hotel, Tokyo, Japan (20 members)  
June 12-13, 2006 Makadam Club, Budapest, Hungary (15 members)  
October 2-3, 2006, Clarion Hotel Admiral, Bergen, Norway (17 members)  
February 8-9, 2007, Ramada Almohades Hotel, Casablanca, Morocco (15 members)  
May 24-25, 2007, Hotel Tatra, Bratislava, Slovakia

Each meeting lasted two days and the following pattern was each time followed:

Welcome  
Local presentations  
Approval of the agenda  
Approval of the minutes of the previous meeting  
Information about the progress since the previous meeting  
General discussion  
Work in subgroups  
Reporting back from groups  
Date, venue and program of the next meeting  
Any other business  
Closing

The progress of the individual groups will be described in separate sections. Selected important agenda items of the individual meetings, including presentations by local persons and technical tours will be described below.

#### *April 20-21, 2004 Cœur de la Défense, Paris, France*

Host: PIARC. Attendance: 15 members

During this kick-off meeting the participants introduced themselves. The chair outlined the working rules. For the task of English and French secretaries Raj Ghaman (E) and Christian Mauroit (F) volunteered and were appointed.

According to the PIARC Strategic Plan, three issues were defined for the Committee:

- Issue 2.3.1 - Urban congestion
- Issue 2.3.2 - Mega cities and transport system
- Issue 2.3.3 - Non-motorised mobility

The goals defined by the strategic theme coordinator were as follows:

Urban congestion;  
Identifying the particular problems for sustainable mobility presented by mega-cities;  
Ensuring that needs of human powered mobility is correctly addressed.

In order to reach these goals, three working groups were set up headed by the following members:

Urban congestion: Terry Wang  
Mega cities and transport system: Ted Vincent  
Non-motorised mobility: Hillie Talens

*October 14-15, 2004, Errera Hotel, Brussels, Belgium*

Host: Christian Mauroit and Alain Broes. Attendance: 24 members

Mr. Marc Lemlin, Belgium Representative to PIARC, Chair of the Belgian Road Association and Secretary General of the Walloon Ministry of Equipment and Transport made a presentation on travel trends in Belgium and European Union. He also presented information on the roadway infrastructure in Belgium and the importance of operations and maintenance of the network. Mr. Lemlin indicated that there is movement to deploy Intelligent Transportation Systems in Belgium.

The delegates were also welcomed by Director General Jean-Claude Moureau (Ministry, Administration of Equipment and Transportation for the Brussels Region). The delegates took a technical tour related to transportation facilities in and around Brussels. The first stop was the Brussels Tunnel Monitoring and Control Center. Additionally the group visited a waterway facility, several unique trolley car stations, special event parking, self enforcing bus bypass lanes and metering of traffic entering the city center.

Mr. Vincent of this committee had agreed to be the liaison with the PIARC's Terminology Committee and he agreed to continue this role.

Mr. Simmer was identified as the liaison to the Technological and Exchange Committee and one of its responsibilities is to identify countries for seminar presentations.

*April 21-22, 2005, Hotel Reghina Blue, Timisoara, Romania*

Host: Cornel Bota. Attendance: 20 members.

Mayor Dr. Eng Georghe Ciuhandu of Timisoara made a speech about his city and introduced some topics on civic, economic and infrastructural issues facing the city. The city has a population of 300,000 with about 50,000 students at the local universities. The city budget is around 120 million Euros. The city will sell bonds to finance future infrastructure improvements. The mayor felt that if Romania was allowed to enter European Union (EU) in 2007, there would be significant monetary improvements for Timisoara.

Mr. Stella of the Romania National Road Administration gave a second presentation. In which he outlined the history of roads in Romania starting AD 100 to 120 with Roman road building leading up to the current network. He also emphasized the importance of the Romanian road network to EU, which amounts to nearly 200,000 km.

Before the meeting, Terry Wang indicated that due to a change in his job he was unable to serve further as a working group leader. Peter Jorritsma took over his tasks.

*October 25-26, 2005, KKR Hotel, Tokyo, Japan*

Host: Takashi Yajima. Attendance: 20 members:

Mr. Akira Endo, Director for Policy Coordination, Ministry of Land, Infrastructure and Transport gave a presentation titled "*Japan's Urban Transport Policy*". He described the history of roads and railways in Japan. Included in the presentation were policies to manage congestion and land use including the cluster buildings based on the existing transportation facilities. A question/answer period ensued after the presentation.

Mr. Yoshio Tanaka of the Tokyo Metropolitan Government made the next formal presentation on *Transport Policies in Tokyo Metropolitan Government*. This presentation consisted of typical transportation issues facing a mega city as well as trends in the population growth in Tokyo, after which the participants were given the opportunity to pose their questions and receive a reply... Some of the inquiries consisted of congestion pricing, safety, parking enforcement and air pollution.

Next on the meeting's program was a technical tour. Several transportation facilities around Tokyo and Yokohama were included in the tour.

*June 12-13, 2006 Hungarian Road Society, Makadam Club Budapest, Hungary*

Host: Csaba Koren and Tibor Keszthelyi. Attendance: 15 members.

Due to change in job, Peter Jorritsma resigned from C2.3. Chair asked Olav Finne to replace him.

Dr. Andras Kovacs, Head of the Road Transport Section of the Ministry of Economy and Transport gave a presentation entitled: "The development of National Road Network in Hungary". Seventy percent of the traffic occurs on the national roads. The traffic grows enormously. It is hoped that there will be enough money to realize the long term planning 2007-2020 with European funds which will take into account environmental aspects (i.e. protest is mounting against the ring road).

The second presentation was given by Mr. Andras Karsa of the Budapest Transport Company and dealt with the "Actualities of Budapest Public Transport". The trend is that the share of public transport is decreasing in the 525 km<sup>2</sup> area. A chip card system has been introduced. Planning is deducted from the results of CAPI (Computer Aided Personal Interviews).

The afternoon technical visit was highlighted by Mr. Tibor Keszthelyi and by a BKV fellow-worker. The main item was road design based on traffic micro-simulation in connection to the M2 metro line reconstruction (shuttle bus system). Another interesting point was the approach for a double bus access to a tram terminal situated in the middle of the road.

*October 2-3, 2006, Clarion Hotel Admiral, Bergen, Norway*

Host: Olav Finne. Attendance: 17 members

Mr. Ove Foldones, Director of Transport for the city of Bergen gave a presentation on the founding of the city, earlier trade with Europe as well as major transportation challenges. There has been an increase in car travel and population growth as well as a decrease in the use of public transportation systems. The city is looking into building toll roads as one of the ways to reduce congestion.

The second technical presentation was made by Mr. Jan Olav Skogland of the Norway Public Road Administration. This presentation was on the engineering to build an outer toll ring road as well as the reconfiguration of some of the existing toll booths and the deployment of AUTOPASS toll collection technology.

In the afternoon the delegates were taken on a technical tour of Norway's fjord bridges, followed by a guided walk in the city.

Besides the usual agenda items, the review process of the abstracts arrived for the Paris Congress was organised.

*February 8-9, 2007, Ramada Almohades Hotel, Casablanca, Morocco*

Host: Anis Balafrej. Attendance: 15 members

In addition to normal business, a workshop was held about the Urban Mobility Plan of Casablanca (see under 2.2 later).

The Introductory Report was finalised.

*May 24-25, 2007, Hotel Tatra, Bratislava, Slovakia*

Host: Bystrik Bezak. Attendance:

In addition to normal business, a special session will be held at the "Mobilita07" Conference (see under 2.2 later).

Other items: finalisation of the technical reports, decision about poster.

1.2. Human powered mobility

*Initial scoping and scheduling*

The purposes of this initial work were to understand the topic from documentation in the PIARC strategic approach, to do some preliminary scoping and scheduling, to define the outputs of the work and to develop a framework for collating information. This took place in the period of the Brussels and Timisoara meetings of TC 2.3, from October 2004 to June 2005.

*Definition, detailed scoping and data collection*

This phase of the work narrowed the original scope on non motorised transport down to human powered transport for the purposes of the work. During this phase two fact sheets were produced to collect information on the importance of human powered transport in urban areas around the world and to get detailed information of six cities. During this phase a questionnaire was also produced to get information about design aspects of bicycle and pedestrian facilities. This took place around the Tokyo, Budapest and Bergen meetings of TC 2.3, from October 2005 to October 2006.

Information was received from the following cities. The cities marked with \* participated in the more detailed study:

<i>City</i>	<i>Country</i>
Helsinki	Finland
Warsaw	Poland
Bergen	Norway
Tokyo*	Japan
Yokohama	Japan
London*	UK
rest of UK	UK
Strassbourg*	France
Lyon*	France
Rennes	France
Paris*	France
Bordeaux	France
Saint-Etienne	France
Toulouse	France
Munster*	Germany
Utrecht*	Netherlands
Enschede	Netherlands
Brussels	Belgium
Antwerp*	Belgium
Hasselt*	Belgium
Bratislava	Slovakia

*Analysing existing information*

This phase of the work involved statistical analyses of data gathered through fact sheets. During this phase of the work the results of the questionnaires were also analysed. This task was carried out around the Budapest, Bergen and Casablanca meetings of TC 2.3, between June 2006 and February 2007.

*Drafting introductory report and collating the technical report*

The results of the questionnaires and the fact sheets were formatted as appendices to the technical report. This technical report and the introductory report were drafted during this work phase. This was done in the period around the Bergen and Casablanca meetings of TC 2.3, from October 2006 to February 2007.

*Finalising the main report and preparing for the World Congress*

This work took place around and after the Casablanca meeting of TC 2.3, and over the Bratislava meeting, from February to May 2007.

## 1.3. Sustainable transport in mega-cities

*Initial scoping and scheduling*

The purposes of this initial work were to understand the topic from documentation in the PIARC strategic approach, to do some preliminary scoping and scheduling, to define the outputs of the work and to develop an information framework for collating information. This took place approximately in the period of the Brussels and Timisoara meetings of TC 2.3, from October 2004 to June 2005.

*Definition and detailed scoping*

This phase of the work defined the concepts “mega-city” and “sustainability” for the purposes of the work. During this phase six mega-cities were chosen for detailed study using existing sources of information. The basis of choice was a range of population sizes and a range of cities in developed countries and countries in transition. This took place around the Tokyo meeting of TC 2.3, from October 2005 to December 2005.

*Collating existing information and reporting on sampled mega-cities.*

This phase of the work involved individual members of the working group producing a report on the mega-city assigned to them, using existing sources of information and the information framework as a structure for the report. During this phase of the work the number of mega-cities chosen for detailed study was reduced from six to four because working group members assigned to two of the mega-cities were unable to carry out their the work. This work was undertaken between the Tokyo and Budapest meetings of WG 2.3, between January and May 2006. The four cities studied are as follows.

<i>City</i>	<i>Country</i>
Tokyo	Japan
Mumbai	India
Paris	France
Mexico City	Mexico

*Drafting introductory report and collating the main report*

The four mega-city reports were formatted as appendices to the main report and the main report was drafted during this work phase. This was done between the Budapest and Bergen meetings of TC 2.3, from June to October 2006. No members of the mega-cities working group were able to be present at the Bergen meeting.

*Finalising the main report and preparing for the World Congress*

This work took place around and after the Casablanca meeting of TC 2.3, and over the Bratislava meeting, from February to May 2007. No members of the mega-cities working group were able to be present at the Casablanca meeting.

#### 1.4. Congestion and its countermeasures

##### *Initial scoping and scheduling*

The task of the subgroup “Urban congestion” of PIARC Committee 2.3 was to find measures how to mitigate congestion in urban areas.

##### *Definition, detailed scoping and data collection*

The first step in accomplishing the given task was to conduct a literature overview on congestion. After completing the overview, the subgroup decided to issue a fact sheet to obtain information about the measures implemented in urban areas to decrease congestion. The recipients were also asked to state measured effects on congestion. The fact sheet was distributed to all members of the Committee 2.3 “Urban Areas and integrated Urban Transport”.

Only nine answers were received to the first questionnaire. The subgroup analysed the fact sheets and concluded that the question on measured results was probably too difficult and the subgroup decided to make a more simplified fact sheet.

In the new fact sheet there was no question on measured effects of the measures on mitigating congestion. If the respondent thought that a certain measure had a mitigating effect on congestion that was considered to be enough.

The simplified fact sheet was sent to the members of the committee and this time 13 more answers were received.

<i>City</i>	<i>Country</i>
Prague	Czech Republic
Warsaw	Poland
Helsinki	Finland
Geneva	Switzerland
Rotterdam	Netherlands
Bergen	Norway
Oslo	Norway
Kanazawa	Japan
Yokohama	Japan
Tokyo	Japan
Osaka	Japan
Naha	Japan
Stockholm	Sweden
London	UK
Bristol	UK
Adelaide	Australia

*Analysing existing information*

All received fact sheets were analysed and summarized. The different measures to decrease congestion were discussed and classified. On the basis of the material the group had gathered, a draft for the contents of the report was made.

*Drafting introductory report and collating the main report*

The work of writing the first draft of the final report was shared between some of the members of the subgroup.

The idea had been to get answers from both developed and developing countries. Unfortunately no answers were received from developing countries, so the measures presented in the report are relevant mainly for developed countries.

*Finalising the main report and preparing for the World Congress*

This work was accomplished around and after the Casablanca meeting of TC 2.3, and over the Bratislava meeting, from February to May 2007.

## 2. PRODUCTIONS

### 2.1. Publications

#### *Introductory report*

The introductory report includes the main findings of the work of TC2.3 and points out some open questions.

#### *Technical report on “Human powered mobility”*

This report gives an overview of the importance of human powered transport in our transportation system, the results of the analyses on the share of the cyclists and pedestrians in the total mobility in twenty cities in general and six cities in detail. The report also offers an overview of the most important design aspects of facilities for bicycles and pedestrians.

#### *Technical report on “Sustainable transport in mega-cities”*

This report comprises the mega-city definition, the transport sustainability definition, summaries of information on the four chosen mega-cities and assessment of those cities on the sustainability criteria. The reports of the four chosen mega-cities are appendices to the main report.

#### *Definition of transport sustainability*

Chapter 2 of the technical report on mega-cities can stand alone as a gallery of definitions of transport sustainability. One has been chosen as a set of criteria on which the four chosen mega-cities have been evaluated.

#### *Technical report on “Congestion and its countermeasures”*

The technical report comprises the urban congestion definition, the method of analysis and survey, the overview of implemented policies and conclusions and recommendations to mitigate congestion in urban areas.

#### *Definition of congestion*

Chapter 4 of the technical report includes the definitions of congestion in urban areas.

#### *Article in Routes / Roads*

Parking Supply Standards using a “Matrix” Approach: Analysis of its potential and applicability by Álvaro Jorge da Maia Seco and Jorge Humberto Gaspar Gonçalves, University of Coimbra, Portugal. Route / Roads 2006. No. 331, pp. 72-81.

## 2.2. Workshops

*February 9, 2007, Office of the Governor of the Region of Great Casablanca, Morocco*

The Committee having willingly accepted the invitation of the Governor of the Region of Casablanca, Mr. Mohamed Kabbaj, a workshop was held about the transport plan of Casablanca. About 10 local persons attended the workshop. First, Mr. Paul Richard Marsal, Chief of the Project "Urban Mobility Plan" of the BCEOM Agency introduced the plan which is before finalisation. Later a number of C2.3 members asked questions and made comments. Most of the questions and comments were related to sustainability aspects. The workshop took about 2 hours.

*May 24, 2007, Slovak University of Technology, Bratislava, Slovakia*

The "Mobilita" Conferences are organised in Bratislava every 3 years. The aim of the Conference is the exchange of the most recent knowledge and experiences between experts, the academic community and people on the field for the purpose of deepening productive cooperation in improving the accessibility of human activities and the quality of life in the cities.

This time PIARC TC2.3 will organise a special session within the two days conference to present the results achieved during this four year cycle in the following three areas: 1. Transport in large cities, 2. Congestion and 3. Human powered transport.

Members of the technical committee C 2.3 from all around the world, as well as renowned Slovakian and foreign experts in land use and transport planning, traffic engineering and highway construction from the Central European countries will participate in the presentations of work results and discussions. The expected attendance is about 200 persons.

## 2.3. Participation to other events

The Technical committee TC4.3 (Road Pavements) had held a Seminar on Urban Pavements in Cracow (Poland) on 21 - 22 September, 2005. The seminar was attended by TC2.3 member Dr. Bystrik Bezak who delivered a presentation on "Sharing the urban road space" and chaired a session, "Issues and specific characteristics of urban roads" representing TC2.3.

The Japanese Road Association held its 26th Japan Road Congress in Tokyo on 26-27 October, 2005. Two representatives of TC2.3 were invited to give a presentation at the congress. TC2.3 member Christer Lundin talked about "The Stockholm Trial: Congestion Charging and Improved Public Transport for less traffic jam and better environment". TC2.3 chair Csaba Koren gave a presentation about ECOCITY projects and co-operations in some EU countries. Both speeches were followed by several questions and answers.

Chair Csaba Koren attended the three meetings of the Strategic Theme Technical Committee Chairs at the following venues:

10th June 2005, Hyatt Hotel, Broad Street, Birmingham, chaired by Ms. Ginny Clark

6 June 2006, Clarion Hotel, Berlin, chaired by Mr. Wolfgang Hahn

June 2007, Bonn, chaired by Mr. Wolfgang Hahn

During these meetings TC chairs reported about progress.

Mr Frédy Wittwer will give a presentation on urban congestion in the Special Session on Congestion at the World Congress of PIARC in Paris in September 2007.

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## **STRATEGIC THEME 2**

### **TECHNICAL COMMITTEE FREIGHT TRANSPORT AND INTERMODALITY (C 2.4)**

#### **2004-2007 ACTIVITY REPORT**

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## COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

### *Chairman*

Eiichi Taniguchi Japan

### *Secretaries*

Yoshikazu Imanishi, Japan

Jean-Charles Poutchy-Tixier, France

### *Subgroup 1: Evolution of freight logistics*

Harouna Cisse, Mali

Olivier Colignon, France

Jean-Louis Glume, Belgium

Younoussa Koïta, Guinea (Facilitator)

Mircea Nicolau, Romania

Emanuele Scotto, Italia

Ali Traore, Burkina Faso

### *Subgroup 2: Alternatives and terminals*

Wanda Debauche, Belgium

Csaba Orosz, Hungary

Jean-Charles Poutchy-Tixier, France

Martin Ruesch, Switzerland

Hans Silborn, Norway (Facilitator)

### *Subgroup 3: Impacts mitigation*

Pieter De Winne, Belgium (Facilitator)

Jan Francke, Netherlands

Yoshikazu Imanishi, Japan

Anders Lundqvist, Sweden

### *Subgroup 4: Guidance for developing countries*

Baasankhuu Manduul, Mongolia (Facilitator)

### *Other members having contributed to the committee activities*

Benoit Cayouette, Canada-Québec

Martine-Sophie Fouvez, ECMT

Mehrdad Hamdollahi, Iran

Paloma Iribas Forcat, Spain

Carlos Santillan, Mexico

## 1. WORK PROGRAMME AND ORGANISATION

### 1.1. Issues

The issues defined for the committee in the strategic plan 2004-2007 were:

- Issue 2.4.1: The response of roads administrations to the development of freight logistics over time and the increase in road freight transport within countries and across countries.
- Issue 2.4.2: Accommodation of the increase in freight movements on road networks and the wider transport infrastructure
- Issue 2.4.3: Mitigation of negative impacts of increased movement of freight

### 1.2. Work programme

The committee broke up into four subgroups. Three of them were each one in charge of one of these three issues, and the fourth one particularly in charge of the developing countries.

The work programmes of each subgroup were:

- Subgroup 2.4.1: To review how countries at different stages of development have dealt with increased freight traffic and to consider examples of how freight logistics has changed and developed and what the key aspects are for the future for countries at different stages of development.
- Subgroup 2.4.2: To review the solutions envisaged as alternatives to freight movement by road and to analyse how intermodal terminals have facilitated improvements in freight capacity.
- Subgroup 2.4.3: To investigate the present and possible innovations in goods vehicles within 20-30 years and their potential impacts and to review in social and environmental effect of cases where modal shift and better integration of modes with regard to the movement of freight have been applied
- Subgroup 2.4.4: To draft a guidance for developing countries to building a sustainable freight transport system

From the three issues of the strategic plan and the subgroups work programmes, the chairman sent a questionnaire to the committee members and corresponding members concerning the situation in their countries. Answers were received from Belgium, Burkina Faso, Canada-Quebec, France, Japan, Mali, Norway, Romania, Sweden and Switzerland. Additional documents were received from Hungary, Guinea, Iran, Italy, Mongolia, Spain and ECMT. International organisations like the United Nations, the World Bank, OECD and other regional organisations sent also documents, electronic files and studies to the committee (see bibliographical references).

### 1.3. Meetings

The committee held regular meetings each year in spring and autumn. The meeting minutes have been drafted in English and French after each committee meeting and are available on PIARC Website. In each meeting, national policies have been presented by committee members or other persons.

The committee meetings were held in Paris (20-22 April 2004), Stockholm (23-24 September 2004), Ouagadougou (13-15 June 2005, jointly with a PIARC international seminar), Tokyo (17-18 November 2005), Oslo (8-9 June 2006), Ulaanbaatar (4-8 September 2006, jointly with a PIARC international seminar) and Zurich (24-25 April 2007).

### 1.4. Extranet

The Committee Extranet, managed by the French-speaking secretary, was used as a tool for the work programme of the committee, but also to set the presentations and all documents useful for the work of the committee. The Extranet has been organised into 12 parts:

1. Chronological account
2. Committee meetings
3. Presentations and slides on national policies, national cases, supranational policies, freight intermodality.
4. Documents (documents provided to the committee by external members or organisations)
5. Publications
6. Questionnaires (questionnaires sent to members by the committee and answers received with related additional documents)
7. Terminology
8. Subgroup 1 "Development of logistics"
9. Subgroup 2 "Alternatives and terminals"
10. Subgroup 3 "Impacts mitigation"
11. Subgroup 4 "Developing countries"
12. TC 19 production 2000-2003

## 1.5. Terminology

Mircea NICOLAU, Romania, has been for the whole period of time the committee liaison member with PIARC committee "terminology".

The glossary on intermodality used to draft the committee reports has been the UN-ECE / ECMT / European Commission glossary "Terminology on combined transport" published by the United Nations in 2001.

An electronic copy of this glossary has been forwarded to PIARC committee "Terminology".

## 2. PUBLICATIONS

### 2.1. Reports

Two reports of the committee have been published concerning the previous cycle work programme (2000-2003):

- Vehicle Size and Weight Limits – Experiences and trends (PIARC reference 19.01.B, 2004)
- Freight modal split (PIARC reference 19.02.B, 2005)

For the cycle 2004-2007, three reports should be published:

- Freight transport and intermodality: Measures promoting alternatives to the road and intermodal terminals (2007)
- Mitigation of negative impacts of increased movement of freight
- Guidance for the developing countries to building a sustainable freight transport system

On March 31<sup>st</sup> 2007, the first one concerning issue 2.4.2 was in the publication process. The second concerning issue 2.4.3 and the third ones were still on hand with a draft report ready in one language only. The publication of these two reports will be probably done by Paris Congress. Concerning issue 2.4.1, the lack of reliable data does not allow accurate operation, but a synthesis of major issues is on hand for the following cycle.

## 2.2. Articles

One article has been published in Routes/Roads 326 (3-2005) on "Emerging problems, potential answers offered by logistical platforms" by Wanda DEBAUCHE. The other article entitled "The safety assessment of the goods vehicle traffic" by Yoshikazu IMANISHI and Eiichi TANIGUCHI was submitted for publication in Routes/Roads in 2007.

## 2.3. National presentations

The following presentations of national policies, often in one language only, have been made during the committee meetings and put on the committee Extranet:

- Belgium: Movement is life: putting traffic on the right road (Pieter DE WINNE, English only)
- Burkina Faso: The policy and measures concerning freight transport in Burkina Faso (Ali TRAORE, French only)
- France: Freight transport policy in France (Olivier COLIGNON, French only)
- Guinea: Policy and measures for freight transport in the Republic of Guinea, Younoussa KOITA, French only)
- Hungary: Main freight transport characteristics, Hungary 1990 – 2005 (Csaba OROSZ, English only)
- Iran: Freight transport in Iran (Mehrdad HAMDOLLAHI, English only)
- Japan: Freight transport policy and measures in Japan (Yoshikazu IMANISHI, English only)
- Japan: Current issues and policy on freight transport in Japan (Atsushi FUKAZAWA, MLIT Japan, English only)
- Mongolia: National transport of Mongolia (Baasankhuu MANDUUL, English only)
- Norway: Freight transport policies and measures in Norway (Hans SILBORN, English only)
- Norway: Current issues and policies on freight transport in Norway (Ole Andreas HAGEN, English only)
- Romania: Freight transport policies and measures, Romania (Mircea NICOLAU, English only)
- Sweden: Transport policy for sustainable development (Anders LUNDQVIST, English only)
- Switzerland: Freight transport policy and measures in Switzerland (Martin RUESCH, English only)

#### 2.4. Other presentations

The following other presentations have been made during the committee meetings and put on the Committee Extranet:

- Management of public space and goods conveyance policy in Paris (Jean-Charles POUTCHY-TIXIER, France, French & English)
- History of the freight transport policy in Japan (Masayuki SHIBAHARA, Japan, French only)
- Advanced dry ports and terminals in Mali (Harouna CISSE, Mali, French only)
- Current issues and policies on freight transport in the region of Oslo (Bjørn NYQUIST, Norway, English only)
- Road safety issues in Sweden (Anders LUNDQVIST, Sweden, English only)
- Freight transport by autonomous heavy carrying dirigibles (Jean LESCAT, published by ECMT; Jean-Charles POUTCHY-TIXIER, published in Ouagadougou PIARC seminar proceedings, English and French)

### 3. SEMINARS AND PARTICIPATION TO OTHER EVENTS

#### 3.1. Ouagadougou Seminar in Burkina Faso (13-15 June 2005)

The seminar organised in June 2005 in Ouagadougou by the PIARC National Committee of Burkina Faso, was devoted on the "Freight transport system in West Africa". The proceedings have been put on PIARC Website and a CD-Rom was published. This seminar gathered 104 participants. This seminar focused on the importance of road infrastructure for freight transport and especially access route to sea ports for landlocked developing countries in Africa. Promotion of international collaboration in the area of freight transport in West Africa was also discussed.

#### 3.2. Ulaanbaatar seminar in Mongolia (6-8 September 2006)

The seminar organised in September 2006 in Ulaanbaatar by the Ministry of Road, Transport and Tourism of Mongolia, was devoted on "Freight transport in landlocked developing and in transition countries". The proceedings have been put on PIARC Website. This seminar gathered around 100 participants. This seminar presented current issues and policy measures on freight transport and intermodality in Asian countries. Overcoming the difficulty of border crossing of neighbouring countries was discussed in terms of seamless freight transport.

3.3. Participation in the UN-ECE / ECMT seminar in Kiev (27-28 September 2004)

The Committee Chairman and Secretaries have been invited to participate in the UN-ECE / ECMT international seminar jointly organised in September 2004 with the Ministry of Transport of Ukraine on "Intermodal Transport Europe-Asia: Opportunities and Challenges". The Chairman Eiichi TANIGUCHI presented the works done by PIAC Committee 2.4. The proceedings and the conclusions of the seminar have been put on the ECMT Website at [www.cemt.org/topics/combined/Kiev04](http://www.cemt.org/topics/combined/Kiev04)

3.4. Participation in the OECD/ECMT Outreach activities seminar---Efficient and reliable intermodal logistics network in Asia-Pacific region in Tokyo (24 November 2006)

The Chairman Eiichi TANIGUCHI participated in the OECD/ECMT Outreach activities seminar in Tokyo. He presented a paper entitled "Reliable freight transport in landlocked developing countries" discussing the current issues and measures to provide efficient and reliable freight transport systems in landlocked developing countries.

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## **STRATEGIC THEME 2**

### **TECHNICAL COMMITTEE ON RURAL ROADS AND ACCESSIBILITY (C 2.5)**

#### **ACTIVITY REPORT 2004-2007**

## SUMMARY

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## LIST OF MEMBERS OF THE COMMITTEE WHO TOOK PART IN THE ACTIVITIES

Members of the committee who contributed to the work of the technical committee.

Kesogukewe M.I.M. Msita, Tanzania (Chair) until June 2006

Jean-François Corté, acting Chair (June 2006 – 2007)

Abdennebi Rmili, Morocco (French-speaking secretary)

Robert Petts, United Kingdom (English-speaking secretary until February 2007)

Josée Arsenault, Canada-Québec

Mme Dóra Fenyő, Hungary

Mehran Ghorbani, Iran

Tony Greening, Zimbabwe

Mihai Iliescu, Romania

Marcel Kabre, Burkina Faso

Mohammed Abdul Karim, Bangladesh

Jean Mathieu Mbaucand, Congo

Norman Roush, USA (until 2006)

Mohammad Mirshahi, USA (from July 2006 – 2007)

Peter O'Neill, United Kingdom

Lamine Sidibe, Mali

Terje Tessem, ILO

### Corresponding members

Maria Ouedraogo, Burkina Faso

Madjid Barazandeh-Tehrani, Iran

Ola Omenås, Norway

### *Associate members*

Armand Der-Stepanian, France

B. Chandrashekar, India

Pasi Patrikainen and Arve Kirkevold (Technical Advisors at the General Secretariat 2006-2007)

Many other persons have been nominated as member or corresponding member but have not contributed to the work.

Mario Anguita Medel, Chile

Giorgio Elia, Italy

Guillermo Torres, Mexico

Daramragchaa Gerelnyam, Mongolia

Karuma Kagyina, Uganda

Andrzej Bartoszewicz, Poland

Bassirou Guissé, Sénégal

Bill Paterson, Canada

George Wang, Canada

Carlos Ruiz, Chile

Pierre Missengue, Congo

Emilia Fernandez, Cuba

Seppo Kosonen, Finland

Norio Nakanishi, Japan

Ikram Benaziz, Morocco

C. Jaarsma, Netherlands

Suos Kong, Cambodia

## 1. INTRODUCTION

“Rural Roads and Accessibility” was one of the key topics of the XXnd World Road Congress in 2003. At the end of the session of past committee CT20 “Appropriate levels of development”, several recommendations were made and their implementation led to the establishment of Technical Committee 2.5 in charge of working in the area of “Rural Roads and Accessibility”, under the umbrella of PIARC Strategic Theme 2.

It is to be noted that several names have been first considered: “needs for rural roads”, “needs for rural mobility” and at the first meeting of the committee, the name « Rural Roads and Accessibility » was selected in relation to the objectives which were assigned to it.

Technical committee 2.5 is one of the five technical committees gathered together within the Strategic Theme “Sustainable mobility”.

## 2. THEMES OF WORK OF THE COMMITTEE

### 2.1. Terms of reference

The terms of reference assigned to the technical committee by the strategic plan were the following.

<b>Issue 2.5.1 - Low volume rural roads have particular issues that affect their contribution to accessibility and mobility in rural areas</b>	
<b>Strategies</b>	<b>Outputs</b>
<ul style="list-style-type: none"> <li>➤ <b>Review</b> how the social and economic functions of low volume roads for rural communities are being appraised and what indicators are used to assess the transport needs</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Report</b> on the present methodologies and indicators</li> </ul>

<b>Issue 2.5.2 - The design and management of low volume rural roads must reflect specific local needs to ensure that provision for mobility is appropriate and fit for purpose</b>	
<b>Strategies</b>	<b>Outputs</b>
<ul style="list-style-type: none"> <li>➤ <b>Assess</b> special requirements for the design of rural roads, considering issues such as safety and non-motorized modes by reviewing specific guidance and developing new ideas</li> <li>➤ <b>Consider</b> how the long-term management of rural roads should be undertaken to safeguard access, taking account of funding and maintenance plans</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Guidance</b> on design issues that deliver cost effective solutions that are fit for purpose</li> <li>➤ <b>Guidance</b> on long-term management plans, using examples from countries at different stages of development</li> </ul>

<b>Issue 2.5.3 – Reduction of the difficulties in funding or delivering transport projects in rural areas, particularly in developing countries or countries in transition</b>	
<b>Strategies</b>	<b>Outputs</b>
<ul style="list-style-type: none"> <li>➤ <b>Consider</b> the key issues affecting the funding of transport projects in remote/rural areas, from both internal resources and external funding agencies</li> <li>➤ <b>Consider</b> the specific skills required for the effective delivery of transport solutions in rural areas</li> <li>➤ <b>Consider</b> the wider governance issues related to the provision and maintenance of transport in rural areas</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Report</b> on key issues affecting the provision of funding for all aspects of rural transport projects</li> <li>➤ <b>Develop guidance</b> on the appropriate project management skills, utilising local resources wherever possible. (e.g. use of seminars and teaching support)</li> <li>➤ <b>Guidance</b> on effective governance, including measures to identify appropriate use of resources</li> </ul>

## 2.2. Work program and organization of the committee

The work program has been defined with the establishment of two sub-groups.

Group 1 led by Jean-Mathieu Mbaucand (Congo)

with the following work topics:

- Review how the social and economic functions of low volume roads for rural communities are being appraised and what indicators are used to assess the transport needs,
- Assess special requirements for the design of rural roads,
- Consider how the long-term management of rural roads should be undertaken to safeguard access, taking account of funding and maintenance plans.

Group 2 led by Peter O'Neill (United-Kingdom)

with the strategies proposed for issue 2.5.3. as work topics.

During the cycle, it appeared, in particular because of the low number of members who actually participated in the works of the committee that the work program couldn't be achieved. In 2206, it was deeply redefined and reduced regarding the objectives and outputs.

For group 1, work and outputs have been redefined as follows.

### Socio-economic indicators

A survey was launched among different countries in order to know how the needs for rural roads are being appraised and which are the indicators used to characterize the need for accessibility in rural areas. The results will be presented during the committee session at the World road congress in Paris.

### Design of rural roads

The committee has done a search and an analysis of the Internet websites dealing with design, construction and maintenance of rural roads. A tool to facilitate the search of information has been defined; it should be implemented on PIARC Internet website.

In addition, the Technical Committee has reviewed and made some suggestions for finalizing the Technical guide on Low cost surfacings prepared by R. Petts as a study financed by DFID.

### Planning and management of rural roads

From the outputs of three seminars organized with the committee, the committee identified a set of cases of best practice in terms of planning and management of rural roads.

For group 2, after a study on the terms of reference to find assistance of a consultant, the work has not been carried further on.

## **3. ACTIVITIES**

### 3.1. Meetings

The committee held seven meetings at the following dates and venues:

- First meeting: 20 - 21 April 2004 in Paris (France)
- Second meeting: 21 - 22 October 2004 in Budapest (Hungary)
- Third meeting: 18 March 2005 in Arusha (Tanzania)
- Fourth meeting: 1 - 2 December 2005 in Siem Reap (Cambodia)
- Fifth meeting: 12 - 13 July 2006 in Paris (France)
- Sixth meeting: 30 November – 1st December 2006 in Paris (France)
- Seventh meeting: 16 -17 April 2007 in Marrakech (Morocco)

### 3.2. Seminars

The committee organized or participated in the organization of three seminars:

- 14 -17 March 2005 in Arusha (Tanzania)  
*Sustainable maintenance of rural roads*
- 28 - 30 November 2005 in Siem Reap (Cambodia)  
*Sustainable access and solutions based on local resources*  
in collaboration with the Minister of Rural Development of Cambodia

The proceedings of the Siem Reap seminar are available from PIARC Internet website

- 16 -17 April 2006 in Rabat (Morocco)  
*Maintenance of rural roads, stakes and perspectives*

in collaboration with the International Commission of Rural Engineering and the PIARC National Committee of Morocco.

### 3.3. Preparation of the XXIIIrd World Road Congress

The Committee prepared a call for paper on the following topics:

- How are the needs for rural roads assessed? What indicators are used? How are priorities determined for planning decisions?
- How States envisage the sustainability of these networks when considering their financial resources?
- Examples of partnerships between the State and various stakeholders i.e.: local authorities, communities, public and private companies, NGOs; in order to secure finance for the provision of rural road programmes, and then to ensure their on-going management and sustainable maintenance.

23 proposals were received and reviewed. The session of the TC 2.5 at the 23rd World Road Congress will be organized with two themes:

- rural transport and poverty reduction,
- participation of local communities.

## 4. LESSONS LEARNT

The Committee suffered from the participation of a too low number of members nominated by the first delegates. Moreover the participation lacked of continuity. Lastly the situation was even worsened by resignation of the Chair and the English-speaking secretary about one year before the World Road Congress in Paris.

The low participation of the members in meetings of the Committee, in particular from representatives from developing countries, has several reasons. The problem of financial resources is one of them but the cause is also the lack of interest of the national authorities which nominated the members to this committee.

A number of issues assigned to the committee too large and too ambitious didn't facilitate the start of the work which would have necessitated human and financial resources outside the group participating in the work.

The discussions held within the committee for the preparation of the Strategic Plan for the 2008 – 2011 period led to the following recommendations:

- works on the them of accessibility to rural areas and rural roads should be focussed on topics which have a strategic nature like planning and management;
- objective of the work should be to raise the level of consciousness of political authorities of developing countries on these topics by benchmarking the policies which are implemented;
- PIARC should involve more widely to the work institutions providing aid for the development.

# STRATEGIC THEME 3

## SAFETY AND ROAD OPERATIONS

### INTRODUCTION

By Joseph S. Toole, USA, Strategic Theme 3 Coordinator

The goal of Strategic Theme 3, "Safety and Road Operations," is to improve the safe and efficient use of the road system, including the movement of people and goods on the road network, while effectively managing the risks associated with road transport operations and the natural environment. During the past four years, the PIARC committees that have focused on these areas have made substantial contributions to improving the operation of roadways around the world. Through both their technical seminars and specific products, these committees have helped increase the base of knowledge available to the roadway community.

The emphasis across all areas of Strategic Theme 3 is on improvements to safety assessments, mechanisms, design and procedures consistent with efficient and effective operations that meet customer and user expectations, with particular emphasis on information systems and information sharing.

Strategic Theme 3 encompasses four technical committees: Road Safety (TC 3.1), Risk Management for roads (TC 3.2), Road Tunnel Operations (TC 3.3), and Winter Maintenance (TC 3.4). The technical committees have been working through the 2004-2007 work cycle in various initiatives to further ST3 goals.

**TC 3.1** held four seminars on road safety, in China, Austria, Togo and Chile, and developed four guidelines documents, one for each of its issue areas. In addition, several committee meetings were held and presentations delivered in various countries on safety topics during the work cycle.

Through its three working groups, **TC 3.2** held six seminars, in France, Italy, Spain, Japan, Vietnam, and New Zealand. A seventh seminar is planned for Colombia in May 2007. In addition, TC 3.2 developed a risk assessment toolbox, guidance on risk management and mega-projects, and a vulnerability assessment model for critical transportation infrastructure. The committee also planned an international survey of risk management to understand the current state of practice in risk management worldwide.

**TC 3.3** published a special issue of the PIARC journal Routes/Roads dedicated to Fire Safety in Tunnels, in October 2004. Several committee members contributed articles to the journal. The committee also published five technical reports, and submitted an additional seven additional technical reports for publication prior to the September 2007 World Congress. The committee also organized two seminars in developing countries (Argentina and China in March and October 2006, respectively). The committee also organized or contributed to additional workshops during the past work cycle, and conducted a joint research project with the Organization for Economic Cooperation and Development, which resulted in the production of Quantitative Risk Assessment and Decision Support Model softwares.

**TC 3.4** published a Snow and Ice data book in 2006 which documented practices in several countries, and expanded upon the first data book published in 2002. The data book was prepared for the XIIth International Winter Road Congress, held in February 2006 in Torino, Italy, which TC 3.4 also organized. A number of technical papers were presented at the Congress in six broad topic areas. In addition, TC 3.4 helped organized an international seminar on Safe and Efficient Winter Maintenance Practices in Latvia in September 2005.

The four committees' activity reports will be presented to the World Road Congress in Paris, France, in September 2007. I would like to take this opportunity to thank the members of the ST3 technical committees for their hard work over the past work cycle. The reports, seminars and other products of their work will further ST3's goals and provide an invaluable resource for sharing knowledge for their counterparts all over the world.

## **STRATEGIC THEME 3**

### **TECHNICAL COMMITTEE ON ROAD SAFETY (C3.1)**

## **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

Hans-Joachim Vollpracht, Germany  
Patrick Mallejacq, France  
Roberto Llamas Rubio, Spain  
Elizabeth Alicandri, United States

### **MEMBERS:**

Mr. Phil Allan, Australia  
Mr. Günter Breyer, Austria  
Bernhard Lautner, Austria  
Mr. Zakir Hossain, Bangladesh  
M. Armand Rouffaert, Belgium  
Rik R. Nuyttens, Belgium  
Mme Michèle Guillaume, Belgium  
M. Yves Fobelets, Belgium  
Sandro Francesconi, Belgium  
Mme Vinciane Lerate, Belgium  
M. Raphael Moussougan, Benin  
M. Issiaka Sigué, Burkina Faso  
Mr Randy Sanderson, Canada  
Mr Tarek Sayed, Canada  
Lise Tourigny, Canada-Quebec  
Mme Lise Fournier, Canada-Quebec  
Mr. Hector De La Huerta, Chile  
Placide Mpan, Congo  
René Bernard Sita, Congo  
Mr. Josef Mikulik, Czech Republic  
Mr. Larus Agustsson, Denmark  
Mr. Aulis Nironen, Finland  
M. Jacques Boussuge, France  
Mme Véronique Feypell, OECD  
François Ganneau, France  
Dr. Sibylle Birth, Germany  
Mrs. Sabine Degener, Germany  
Mr. Anastasios Tsaglas, Greece  
Mr. Anastasios. Tsantsanoglou, Greece  
Dr. Peter Hollo, Hungary  
Mr. Aditya A. P. Bahadur, India  
Ms. Mehran Ghorbani, Iran  
M. Lorenzo Domenichini, Italy  
M. Federico Botto, Italy  
Dr. Yoshitaka Motoda, Japan  
M. Abdoulaye Tandina, Mali  
Mr. Finn Harald Amundsen, Norway  
Tariq Mahmud, Pakistan  
Mr. Yong He, People's Republic of China  
Mr Krzysztof Kowalski, Poland  
Eng. Paulo N. Rodrigues Marques Augusto, Portugal  
M. João M. Sousa Marques, Portugal

Mr. Liviu Staniloiu, Romania  
Åsa Erson, Sweden  
Mr. Ake Larsson, Sweden  
Dr. Margie Peden, WHO  
Mr. Pieter Van Vliet, The Netherlands  
ir. P.M.W. Elsenaar, GRSP  
Mr. Eddy Westdijk, The Netherlands  
Mr. Atze Dijsktra, The Netherlands  
Mr. Mike GreenHalgh, United Kingdom  
Mr. Steve J. Lee, United Kingdom  
Robert Hull, United States  
Mr. Tawanda W. M. Mdawarima, Zimbabwe  
Jokonya M. Romaldo, Zimbabwe

#### CORRESPONDING MEMBERS

M. A. Nassourou Cisse, Burkina Faso  
Mr. Abel Martinez Gomez, Cuba  
Mr. Abbas Mahmood Abadi, Iran  
Kunihiko Mr Oka, Japan  
Mr. Roberto Magallanes, Mexico  
Colin Brodie, New Zealand  
M. João Cardoso Lemos, Portugal  
M. Carlos De Almeida Roque, Portugal  
M. Felix Buser, Switzerland  
Mr. Denis Sabiiti. Uganda  
Mr. Patrick Hasson, United States

#### ASSOCIATE MEMBER

Mr. Sany Zein, Canada  
Mr. Rajnandan Singh, India  
Ray Cook, New Zealand  
Ms. Guro Ranes, Norway  
Dr. Ignatio Del Rey, Spain

## 1. THE WORK PROGRAMME AND ORGANIZATION

The issues assigned to TC3.1 were:

Issue 3.1.1 – Make cost-effective road-safety investments	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>● Compare the methods for diagnosing the nature of safety problems and selecting countermeasures</li> <li>● Analyze the methodologies used in priority ranking sites and proposed improvement projects</li> <li>● Evaluate the methods of implemented safety improvement projects</li> </ul>	<ul style="list-style-type: none"> <li>● Presentation of the methods and recommendations</li> <li>● Presentation of the methods and recommendations</li> <li>● Presentation of the methods and recommendations</li> </ul>
Issue 3.1.2 – Improve road design concepts in relation to road safety	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>● Investigate improvements to geometric road design policies</li> <li>● Identify road system wide safety improvements</li> <li>● Review the practice of road safety investigations on existing roads</li> </ul>	<ul style="list-style-type: none"> <li>● Up-grade of PIARC Road Safety manual</li> <li>● Presentation of success stories and recommendations for implementation</li> <li>● State-of-the-practice (road safety audits/safety reviews...) and recommendations for improving the methodologies and their implementation</li> </ul>
Issue 3.1.3 – Take advantage of intelligent vehicles and infrastructure technologies to improve road safety	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>● Identify concepts and assess their appropriateness</li> <li>● Analyze status and plans for implementation of intelligent technology systems on roads and in cars</li> </ul>	<ul style="list-style-type: none"> <li>● Guidelines for recommended concepts and countermeasures</li> <li>● Analysis of cost effectiveness and recommendations for implementation</li> </ul>
Issue 3.1.4 – Take into consideration human behavior	
<i>Strategies</i>	<i>Outputs</i>
<ul style="list-style-type: none"> <li>● Determine status of worldwide activities regarding human factors and users behavior analysis</li> <li>● Investigate relationship to roadway design and operations</li> </ul>	<ul style="list-style-type: none"> <li>● Identification of gaps and research needs</li> <li>● Guidelines for design and operations</li> </ul>

TC3.1 organized itself in four teams:

- TC3.1 organized itself in four teams:
- Team One: Make Cost Effective Road Safety Investments
- Team Two: Improve Road Design Concepts in Relation to Road Safety
- Team Three: Take Advantage of Intelligent Vehicles and Infrastructure Technology to Improve Road Safety
- Team Four: Take into Consideration Human Behaviour

## 2. THE PRODUCTIONS

### 2.1. TC meetings

Seven technical committee meetings were held over the course of the term. The meetings permitted exchanges of information on various road safety issues and provided opportunities for teams to work on critical road safety products. They were also an excellent opportunity to hear presentations on the road safety situation in various countries, most notably those hosting the meetings.

#### List of TC meetings

- 26 – 27 May 2004, Paris France
- 27 – 29 October 2004, Budapest Hungary
- 18 – 20 April 2005 Thessaloniki Greece
- 16 - 17 October 2005, Beijing China
- 24 – 27 April 2006 Vienna Austria
- 9 – 10 October 2006 Lome Togo
- 10 – 14 April 2007 Santiago Chile

#### List of presentations on road safety situation in various countries:

- Australia (October 2004)
- Netherlands (October 2004)
- Japan (October 2004)
- Norway (October 2004)
- France (October 2004)
- England (October 2004)
- India (October 2004)
- Hungary (October 2004)
  
- Finland (April 2005)
- Poland (April 2005)
- Canada (April 2005)
- China (April 2005)
- Belgium (April 2005)
- Denmark (April 2005)
- Greece (April 2005)

- Iran (October 2005)
- China (October 2005)
- Canada-Quebec (October 2005)
- Pakistan (October 2005)
- United States (October 2005)
- Netherlands (October 2005)
- Greece (October 2005)
- Japan (October 2005)

- Pakistan (April 2006)
- India (April 2006)
- France (April 2006)
- Austrian (April 2006)

- Zimbabwe (October 2006)
- Sweden (October 2006)
- Togo (October 2006)

## 2.2. Outputs and Publications

### Guidelines on Issue 3.1.1

- Guideline for Road Engineers About Accident Investigations
- Guidelines on Road Safety Inspections
- Report on Network Safety Management

### Guidelines on Issue 3.1.2

- Guidelines on Road Safety Audits
- Catalogue on Bad and Good Design Policies and of Cost Effective Road Safety Measures (combined catalogue with Issue 3.1.1)

### Report on Issue 3.1.3

#### Report on ITS Measures and Safety Benefits

### Guideline on Issue 3.1.4

#### Guideline on Human Factors in Road Design and Operation

## 2.3. Seminars

- Beijing China October 2005 “Beijing International Road Safety Seminar” co-sponsored by the Chinese Ministry of Communication. This seminar included over 35 international presentations, 6 roundtable discussions and approximately 500 participants.
- Vienna Austria April 2006 “Human Factors in Traffic Engineering” co-sponsored by CEDR (Conférence Européenne Des Directeurs Des Routes (European Conference of Road Directors). This seminar included four international presentations and extensive accident case studies and analyses methodologies and approximately 30 participants.
- Lome Togo October 2006 “Developing Expertise in Road Safety Engineering” co-sponsored by AGEPAR (Association Des Gestionnaires Et Partenaires Africains Des Routes) (Association of African Road Managers and Partners). This seminar included over 25 international presentations, extensive site visits and discussions and approximately 300 participants

- Santiago Chile April 2007 “Road Network Operations Management (ITS) and Road Safety Seminar” co-sponsored by the Chilean Highway Directorate this seminar included approximately 50 international presentations.

#### 2.4. Cooperation with international agencies

- OECD-ECMT
- World Health Organization (UN Road Safety Collaboration)
- Global Road Safety Partnership
- European Transport Ministers
- Transportation Research Board
- IRTAD (International Road Traffic and Accident Database)
- SSAPT world bank (see below)

### 3. PARTICIPACION IN OTHER EVENTS

TC3.1 members participated in a number of other events and activities related to their PIARC duties, which are listed below.

#### 3.1. TC3.1 Chairman Hans-Joachim Vollpracht spoke at a number of conferences including:

- Contribution to the Xth PRI World Congress, 27-29 March 2006, Abu Dabi, United Arab Emirates
- IRF European Road Safety conference, Amsterdam, 5<sup>th</sup> April 2006  
Innovations in infrastructural Road safety
- “The interface between road infrastructure and the road users”
- VI National Road Safety Symposium, Seville (Spain), May 2006
- “PIARC International Committee Activity”
- Participation in the SSATP workshop in Addis Ababa Ethiopia
- Participation and contributions to the UN Road Safety Collaboration Meetings in London October 2005, Geneva 2005 and October 2006

#### 3.2. Chairman Hans-Joachim Vollpracht was the expert and/or project manager in field studies (Inspections, audits, trainings) in Romania, Vietnam and South Korea

#### 3.3. Secretary Elizabeth Alicandri organized and co-chaired a session on International Roadway Safety at the 2005 Transportation Research Board Meeting in Washington DC (USA).

#### **4. CONCLUSIONS AND REMARKS**

This term of the road safety committee has been very successful. We have developed a number of extremely useful publications, and are particularly proud of the number of seminars we have been able to work on. Providing information and guidance to developing countries with regard to road safety has been a pressing focus for this committee, and this has been difficult, when members from developing countries are not able to participate in technical committee activities and meetings, but we still feel we have successfully met that need. There is always more to be done in road safety, but the products of this committee will help raise the bar in terms of improving road safety approaches in developed and developing countries.

## **STRATEGIC THEME 3**

### **TECHNICAL COMMITTEE ON RISK MANAGEMENT FOR ROADS (C3.2)**

#### **2004-2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS WHO CONTRIBUTED TO THE ACTIVITIES**

Michio Okahara, Japan  
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Anders Plovgaard, Denmark  
Denis Davi, France  
Robert Arditì, Italy  
Terry Brown, New Zealand  
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Enrique Belda Esplugues, Spain  
Johan Hansen, Sweden  
Michel Donzel, Switzerland  
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Akira Sasaki, Japan  
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## EXECUTIVE SUMMARY

Many parts of the world are at significant risk of natural and man-made disasters. Modern industrial practices, dependencies on critical infrastructures make countries further vulnerable to not only a wide range of natural disasters but also serious man-made disasters. These factors, combined with increased population densities and property development in hazard zones, have heightened countries' disaster risks as follows:

1. Natural disasters, include typhoons, cyclones, hurricanes, flooding, tornadoes, drought, wildfires, earthquakes, volcanoes, landslides, ice storms, and dust storms that all contribute to disease epidemics.
2. Man-made disasters, include critical infrastructure threats, oil and chemical spills, building fires, mechanical equipment explosions, and terrorism.

TC 3.2 of Strategic Theme 3 lays special emphasis on integrated risk management for roads with expanded research into risk assessment, decision-making processes, reduction of risk and risk management tools. More specifically TC 3.2 has the three terms of reference:

1. Introduce risk management techniques in the road sector
2. Introduce risk management for mega-projects
3. Improve highway systems security

Since the beginning, TC3.2 has been making considerable efforts to achieve its objectives, by organizing six meetings in various countries and one international seminar in Ha Noi, Viet Nam. One more meeting and the 2<sup>nd</sup> international seminar are scheduled to be held in Cartagena in Columbia before the World Road Congress in Paris.

To formulate and improve various risk management strategies for the future, TC 3.2 will prepare the technical session agenda for the World Congress in Paris as follows:

1. Opening Remarks
2. TC3.2 Activities for the Cycle
3. Introduction of Risk Management Techniques
  - Risk Management for Roads
  - Risk Management for Mega Projects
  - Risk Management for Highway Systems Security
4. Workshop on Risk Management for Roads
  - Implementation of the Hyogo Framework for Action - Risk Management for Roads
  - Considering Risks in Public Infrastructure's Owners Choices in the Road Sector in Europe
  - Risk Management Process Manual In New Zealand
  - Discussion
5. Future Activities and Resolutions
6. Closing Remarks

## 1. WORK PROGRAM AND ORGANIZATION

Meetings and seminars of TC3.2 were organized as follows:

Table 1 Meetings and Seminars

No.	Date	Place	Summaries
1	26 and 27 May, 2004	Paris, France	<ul style="list-style-type: none"> <li>- The chair went through the work program he prepared and proposed to have five sub-working groups in the technical committee, including one for the seminars. He put stress on the importance of producing clear-cut and attractive outputs.</li> <li>- Schedule of meetings and seminars was discussed.</li> </ul>
2	13 and 14 October, 2004	Torino, Italy	<ul style="list-style-type: none"> <li>- Examples of risk management in Italy were presented.</li> <li>- Overall schedule of the TC3.2 meeting and seminars was discussed.</li> <li>- Contents regarding Survey I&amp;II were discussed.</li> </ul>
3	13 and 14 April, 2005	Valencia, Spain	<ul style="list-style-type: none"> <li>- Examples of risk management in Spain were presented.</li> <li>- Structure of the final report was discussed.</li> <li>- Risk management toolbox was proposed.</li> </ul>
4	25-27 October, 2005	Tokyo, Japan	<ul style="list-style-type: none"> <li>- Examples of risk management for roads in Japan were presented.</li> <li>- Results of the first international survey were explained.</li> <li>- The International Symposium was held at the 26<sup>th</sup> Japan Road Congress</li> </ul>
5	24-27 April, 2006	Hanoi, Viet Nam	<ul style="list-style-type: none"> <li>- Road administration and risk management in Viet Nam was presented.</li> <li>- A final report framework was discussed and responsible persons were decided for its chapters.</li> <li>- The first international seminar and TSUNAMI workshop were held.</li> </ul>
6	27 and 28 February, 2007	Auckland, New- Zealand	<ul style="list-style-type: none"> <li>- The contents of second international seminar in Colombia was discussed.</li> <li>- Final report and activity report was discussed. <ul style="list-style-type: none"> <li>- The contents of TC Session and Special Session for the 23rd World Road Congress were discussed.</li> <li>- International Workshop on Risk Management for roads was held.</li> </ul> </li> </ul>
7	2-4 May, 2007	Cartagena, Colombia	<ul style="list-style-type: none"> <li>- The second international seminar will be held.</li> </ul>
8	17-21 September, 2007	Paris, France	<ul style="list-style-type: none"> <li>- PIARC World Road Congress</li> </ul>

### 1.1. Brief summary of the working groups

For the purpose of the mitigation of various damages accrued by the road related risks, TC3.2 has been working to achieve our common goals such as “improvement of the safe and efficient use of the road system” and “effective management of the risk associated with road transport operations and the natural environment”, to meet the ever increasing demand of risk management and to serve as a link between practice, sciences, policy making and decision making in the search for the risk management for roads. The work program has followed the structure of the terms of reference given at the first meeting in Paris.

Table 2 Terms of Reference for TC 3.2

Issue 1 - Introduce risk management techniques in the road sector	
Strategies	Outputs
<ul style="list-style-type: none"> <li>· Collect and analyze information about Integrated Risk Management from a strategic organizational standpoint</li> <li>· Collect information about the use of quantitative risk assessment/management tools and develop best practices/ lessons learned on risk based decision making</li> <li>· Study how security risks/vulnerability can be used to assess major transportation alternatives and impact the decision making process</li> </ul>	<ul style="list-style-type: none"> <li>· Recommendations on how risk management can be used in an organization to guide programs/projects</li> <li>· Report on existing practices</li> <li>· Model Integrated Risk Management Framework that can be used as a Guide</li> <li>· Quantitative risk assessment toolbox of techniques and methodologies which can be applied to the transportation community</li> </ul>
Issue 2 - Introduce risk management for mega-projects	
Strategies	Outputs
<ul style="list-style-type: none"> <li>· Study the use of risk assessment tools on mega-projects and assess their success</li> </ul>	<ul style="list-style-type: none"> <li>· Guidance on better use of risk management on mega- projects to maintain public trust and confidence</li> </ul>
Issue 3 - Improve highway systems security	
Strategies	Outputs
<ul style="list-style-type: none"> <li>· Investigate the application of risk management principles to the reduction of risk for the highway system</li> </ul>	<ul style="list-style-type: none"> <li>· Vulnerability assessment model for critical transportation infrastructures</li> </ul>

TC3.2 consists of 3 subgroups and each responsibilities and targets are explained as follows:

The subgroup 1 has been tasked with the responsibility in collecting and analyzing information about Integrated Risk Management from a strategic organizational standpoint, simultaneously, collecting information about the use of quantitative risk assessment/management tools and develops best practices/ lessons learned on risk based decision making. In addition, the subgroup 1 has studied how security risks/vulnerability can be used to assess major transportation alternatives and impact the decision making process.

The targets of the subgroup 1 was to make a recommendations on how risk management can be used in an organization to guide programs/projects and to model the Integrated Risk Management Framework and finally, to prepare the quantitative risk assessment toolbox of techniques and methodologies which can be applied to the transportation community.

The subgroup 2 has been tasked with the responsibility in considering the risk management for mega-projects that involves the components planning, design, construction, operation and reconstruction of the management process for road networks. The operational aspects have to be considered in the phases planning and design. Sweden has guidelines for risk management in the following sub areas: balanced scorecard, project, network management, internal safety, and crisis management.

The risk management process consists of the following steps: risk identification, risk evaluation, and execution of measures. Risk identification and evaluation includes the aspects of time, cost, function, property (owned by the project or external), human (staff, road user, and third party), intangible assets (image, human resources, etc), and environment. The risk evaluation is based on a matrix considering the probability and the consequences of the risks. Evaluating risk, all aspects mentioned before need to be considered and balanced.

As a case study of risk management for projects, the Southern Link in Stockholm and so on was presented. Based on the examples, the interfaces of risk management with the project sponsor, the project management, the product, and external stakeholders were illustrated.

The subgroup 3 has been tasked with the responsibility of gathering information on the application of risk management principles related to Highway Systems Security.

Following the terrorist events of September 2001 matters related to Highway Systems Security have become increasingly important over the last few years as the level of awareness has, itself, become more widespread. Therefore many organizations have become increasingly involved in this area of expertise and several methodologies and approaches were developed to assist responsible authorities in the assessment of vulnerabilities of their infrastructure and the identification of critical assets.

In order to complete our task, a review of existing documentation on this subject was performed for the purposes of summarizing pertinent sources of information designed to provide assistance in the reduction of the impact of Highway Systems Security threats and events.

The objective of this subgroup was to present a summary and overview of existing information with an ultimate objective to provide access to facilitating tools to persons responsible for the application of a vulnerability assessment process to their highway infrastructure system.

## 1.2. International Seminars

The 1<sup>st</sup> PIARC international seminar jointly organized by TC3.2 and the Ministry of Transport, Viet Nam was held from the 26<sup>th</sup> to 28<sup>th</sup> of April 2006. 180 participants gathered (50 from overseas including Japan, Canada, New Zealand, France, Sweden, Norway, Switzerland, Spain, Italy, Malaysia, India, Sri Lanka and Indonesia +130 from Viet Nam) and 22 papers were presented (9 from TC3.2 International Committee Members and 13 are Invited) regarding the risk management for roads.

The seminar consisted of four sessions and one workshop:

- Session 1: Introduction of RM Techniques
- Session 2: RM of Natural Hazards
- Session 3: RM of Man-made Hazards
- Session 4: RM for Projects and Organization
- International Workshop on Tsunami



Figure 1 Opening Remarks by TC3.2 Chairman,  
Dr. Michio Okahara



Figure 2 View of the Seminar

The report of this seminar can be found on the PIARC web site. (refer to <http://www.piarc.org/en/>)

The 2<sup>nd</sup> Seminar will be held in Cartagena in Colombia with the support of the Ministry of Transport from Colombia and with the help of the National Spain committee.

### 1.3. International survey of Risk Management

TC 3.2 planned an international survey to understand the current status of risk management techniques and practices, and thus to complement the expertise of the committee members. This international survey is two-fold, and the first survey was characterized as the first step to obtain more detailed information through the second survey.

The first questionnaire of the international survey was prepared in three languages (English, French and Spanish) and TC3.2 had received 25 answers of their first International Survey from 23 countries by April 04, 2006.

## 2. PAPERS AND PRESENTATIONS

### 2.1. Papers

Some members have made papers regarding risk for roads. See table 3.

**Table 3 List of papers regarding risk management for roads**

Title	Authors	References
The repercussions of Katrina storm in Quebec	Line Tremblay, French Speaking Secretary of PIARC TC 3.2, Canada-Quebec	Routes/Roads 2006-N 329
Quantitative risk estimation of road slope disaster	H.KOHASHI, N.TSUNEOKA, M.TANAKA, H.TAKAHARA, T.HAMADA, Public Works Research Institute, Japan	Routes/Roads 2006-N 329
Risk management on mega projects an example of An operational risk analysis	Anders PLOVGAARD, Head of design, Road, Directorate, Denmark, Member of PIARC TC3.2	Routes/Roads 2006-N 329
The report of 1 <sup>st</sup> PIARC international seminar	MICHIO OKAHARA, HIROYUKI NAKAJIMA, KEI TESHIMA, AKIRA SASAKI, Japan	Road Engineering & Management Review, July ,2006, Japan

## 2.2. Presentations

TC 3.2 has organized meeting focussing on knowledge in Risk management. Members have shared best practices and lessons learned from their experience in risk management.

Table 4 Presentations made by members

Title	Country
The 2nd International Committee Meeting in TORINO, ITALY	
Risk management in Sweden, Johan Hansen	Sweden
Highway Systems Security, Michel Cloutier	Canada
Example of a risk management process in Italy " The Fréjus tunnel" Roberto Arditi	Italy
The 3rd International Committee Meeting in VALENCIA, SPAIN	
Example of a risk management process in Italy, Robert ARDITI	France
Practice of a Mega Project considering RM "Bridge over the sea, Anders PLOVGAARD	Denmark
RM in making decisions: The West Ring of Bergen, Norway, Gunnar LOTSBERG	Norway
Introduce Risk Management for Mega project, Denis DAVI	France
Civil Protection at Ministry of Transport Quebec, Line TREMBLAY	Canada-Quebec
Risk Management in planning phase of a road project (175), Line Tremblay	Canada-Quebec
The 4th International Committee Meeting in TOKYO, JAPAN	
An analysis of landslide risk management on the basis of the movement characteristics, Mr. Kazuhori Fujisawa	Japan
Research on the quantitative risk estimation method of road slope disaster, Mr. Hidetoshi Kohashi	Japan
The research on the monitoring system of road slope disaster », Mr. Hidetoshi Kohashi	Japan.
Risk management study on transportation blockage countermeasures for a scenario earthquake, Mr. Haruhiko Wetsuka	Japan.
SH73 Springfield to, Arthur's pass slope stability evaluation, Terry Brown	New Zealand
Risk Management for the Swiss National Highway System and its Bridge Stock. Michel Donzel	Switzerland
Risks management related to climate change and its impact on infrastructures, Mr. Denis Davi (on behalf of M. Hervé Guérard)	France
The Millau Viaduct (from risks management perspectives), Mr. Denis Davi	France
Mt Rapehu lahar risk management process, Terry Brown	New Zealand
Risk management practice in the Southern Link Project in Stockholm, Mr. Johan Hansen.	Sweden
Civil Protection risk identification and assessment, Mrs. Line Tremblay	Canada-Quebec
Technical toolbox for risk management, Shinjuro Komata,	Japan

Title	Country
The 5th International Committee Meeting in HA NOI, VIET NAM	
Technical toolbox for risk management, Mr. Teshima	Japan
Risk management techniques in the road sector, Johan Hansen	Sweden
Risk management for mega-project, Denis Davi	France
Highway systems security. Michel Cloutier	Canada
VIET NAM Seminar	
Risk Sharing in International Projects: In View of Incomplete Contracts	Japan
Introduction of RM for roads, Terry Brown	New Zealand
Introduction of RM for projects, Denis Davi	France
Introduction of RM for Highway Systems Security. Michel Cloutier	Canada
PIARC activities and results of international survey, Hiroyuki Nakjima	Japan
Climate Change and Its impacts on Infrastructures, The GeRiCi Project, Hervé Guérard	France
Earthquake and Risk Management, M. Maeda	Japan
Seismic Risk Assessment Tool for Road Networks, Denis Davi	France
Development of Road Slope Risk Management System Focusing on an Evaluation of Optimum Maintenance and Repair Plan	Japan
One Example of Road Tunnel Rout Modification Caused by Landslides	Japan
Emergency Response Guidebook CANUTEC, Michel Cloutier	Canada
Civil Protection Risk Management and Assessment, Line Tremblay	Canada-Quebec
Risk management in Sweden, Johan Hansen	Sweden
Risk Management in the Planning Process for a Long Subsea Road Tunnel in Norway, Gunnar Lotsberg	Norway
The 6 <sup>th</sup> meeting in AUCKLAND, NEW ZEALAND	
Risk management for roads, Roly Frost	New Zealand
Sweden National Report- An approach to risk management in a road transport authority, Johan Hansen	Sweden
Risk management for road disasters in Japan, Kei Teshima	Japan
Highway systems security. Michel Cloutier	Canada
Risk management activities in Switzerland, Michel Donzel	Switzerland
Others	
PIARC risk management technical committee, MICHIO OKAHARA, KEIICHI, TAMURA, KEI TESHIMA, SHINJURO KOMATA, AKIRA SASAKI, HARUHIKO UETSUKA, 2 <sup>nd</sup> International Symposium on Tunnel Safety & Security, March 15-17, 2006	SPAIN

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- A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection, Appendices A – F, (Science Applications International Corporation SAIC, Transportation Policy and Analysis Center, May 2002)) Prepared for The American Association of State Highway and Transportation Officials' Security Task Force As National Cooperative Highway Research Program Project 20-07/Task 151BA
- A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents (Parsons Brinkerhoff – PB Farradyne, May 2002)
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- Emergency Preparedness for Transit Terrorism (Annabelle Boyd, John P. Sullivan, June 2000)
- Enterprise Systems article 5/9/2006, "Employees Cause Most Security Breaches, Yet Response Lags" <http://esj.com/Security/article.aspx?EditorialsID=1769>
- Evaluation of US Commercial Motor Carrier Industry Challenges and Opportunities (ICF Consulting, March 2003)
- Expressway Technology Center of Japan: Photographic Presentation of Highway Maintenance, April 1996
- Improving Surface Transportation Security (Daniel F. Morgan, H. Norman Abramson, December 2000)
- Information Week, June 12, 2006 "The Threat Within"
- <http://www.informationweek.com/story/showArticle.jhtml?articleID=188703447>
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- Japan River Association: Manual for River Works in Japan Design 1, 2, 2000 (in Japanese)
- Japan Road Association: Handbook of Countermeasures for Rockfall, 2000 (in Japanese)
- Japan Road Association: Specifications for Highway Bridges Part 4 Substructures, 2002 (in Japanese)
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- Japan Society of Civil Engineers: Site Investigation and Stabilization Methods for Rock Slopes, 1999 (in Japanese)
- Japanese Geotechnical Society: Design and Execution Standard for Ground Anchor, 2000 (in Japanese)
- Methodological Framework Paper, Identification and Assessment of Vulnerable Assets in the Road Transportation System, Gouvernement du Québec, Ministère des Transports, Service de la Sécurité civile, March 2006
- National Incident Management System (Homeland Security, March 2004)
- National Needs Assessment for Ensuring Transportation Infrastructure Security" Requested by: American Association of State Highway and Transportation Officials (AASHTO) Transportation Security Task Force Prepared by: Douglas B. Ham & Stephen Lockwood, Parsons Brinckerhoff (PB)
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#### Web Sites:

##### Value management

There are some useful references to Value Management websites. A useful site with links to UK and Hong Kong is the Institute of Value Management Australia ([www.value-management.com.au](http://www.value-management.com.au)). *Value Management (including the associated names of Value Analysis and Value Engineering – by which it is often called in some other countries) has been used world-wide for more than 50 years. In that time it has developed into a process that is directed towards maximising the value from a total system, that is to “provide the required function at the lowest cost, without impairing quality or reliability.”*

US SAVE International [www.value-eng.org](http://www.value-eng.org)

Institute of Value Management [www.ivm.com](http://www.ivm.com)

Canada Canadian Society for Value Analysis [www.scav.csva.org](http://www.scav.csva.org)

Japan Society of Japanese Value Engineering [www.sjve.org/hp/english](http://www.sjve.org/hp/english)

UK Department of Trade and Industry [www.dti.gov.uk](http://www.dti.gov.uk)

#### Research on Road Network Risk Management:

Transfund New Zealand has conducted research into the assessment of hazards and the application of risk assessment for road networks. An approach to the application of risk assessment methodologies is reported in the following research reports.

- Research Report No 147, The Security of New Zealand's Strategic Roding System; Montgomery Watson NZ Ltd
- Research Report No 148, Risk Assessment Methods in Road Network Evaluation; Dalziell, Nicholson, Wilkinson; University of Canterbury, NZ
- Research Report No 217, Natural Hazard Risk Management for Road Networks, Part I:Risk Management Strategies; Brabhaharan, Fleming; Lynch, Opus International Consultants, Wellington NZ
- Research Report No 222, Natural Hazard Risk Management for Road Networks, Part II:Risk Implementation Strategies; Brabhaharan, Moynihan, Opus International Consultants

## **STRATEGIC THEME 3**

### **TECHNICAL COMMITTEE ON ROAD TUNNELS OPERATION (C3.3)**

#### **2004-2007 ACTIVITY REPORT**

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Ruth Haug, Norway  
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## 1. WORK PROGRAMME AND ORGANIZATION

### 1.1. Introduction

Since its creation in 1957, the PIARC Technical Committee on Road Tunnel Operations (formerly known as the PIARC Committee on Road Tunnels) has concentrated its activities on the fields of internal design, safety of users, equipment, operation and environment of road tunnels. It has voluntarily excluded from its scope the subjects concerning construction, repair and maintenance of structures, which are dealt with by the International Tunnelling Association ITA-AITES, with which an excellent collaboration is maintained.

The serious road tunnel fires which occurred in Europe in 1999 and 2001 focused attention on road tunnel safety. This culminated in the production of an EU Directive on minimum safety requirements for tunnels in the trans-European road network, which was issued in April 2004. This document recognized the work which had been undertaken by PIARC in making invaluable recommendations to help improve and harmonise safety equipment and traffic rules in road tunnels. Having been closely involved in the formulation of the Directive during the previous cycle, C3.3 now turned its attention to many of the issues which this new document raised.

As well as the topical safety issues, the Committee continued to review and report on the other aspects of the efficient and effective operation of road tunnels.

To undertake this work, the Committee set up a number of working groups, each commissioned to investigate and report on specific aspects of the work under consideration. Initially, there were six working groups, but the work of two of them (working groups 2 and 5) were so closely related that they were quickly merged into the single working group 2. The working groups included C3.3 members as well as a number of experts who were not members of the Committee. C3.3 steered, reviewed, discussed and approved the documents produced by the working groups. More details of these working groups are provided below.

C3.3 met regularly as follows:

- 26/27 May 2004                      Paris, France
- 2/3 December 2004                Rome, Italy
- 24/25 May 2005                     Sydney, Australia
- 6/7 October 2005                  Dubrovnik, Croatia
- 27/28 March 2006                  San Juan, Argentina
- 16/17 October 2006                Chongqing, China
- 4/5 June 2007                        Kyoto, Japan

## 1.2. Working Group 1: Tunnel Operation

### Leader:

Jean-Claude Martin, France

### Secretary:

Eric Norstrom, Norway

### Active members:

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Bernard Blaszczyk, Belgium  
Zhi Han, People's Republic of China  
Petr Kolatek, Czech Republic  
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Gilles Arnaudet, France  
Pierre Merand, France  
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Nik Gharouni, Iran  
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Eduardo Angelozzi, Italy  
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Hans-Rudolf Scheidegger, Switzerland  
John Zumeris, UK  
Matt Greer, USA

### Programme:

- Improve behaviour of operating staff
- Analyse operation of urban tunnels with high traffic

### Meetings:

- Lyon, France                      September 2004
- Barcelona, Spain                February 2005
- Wien, Austria                     June 2005
- Nice, France                        October 2005
- Utrecht, Netherlands          February 2006
- Prague, Czech Republic        June 2006
- Liverpool, UK                     September 2006
- Paris, France                        March 2007

### 1.3. Working Group 2: Management of Tunnel Safety

Leader:

Rudolf Horhan, Austria

Secretary:

Alain Jeanneret, Switzerland

Active Members:

Bernhard Kohl, Austria  
Pierre Schmitz, Belgium  
Ludvik Sajtar, Czech Republic  
Jiri Smolik, Czech Republic  
Milan Holicky, Czech Republic  
Ulla Vesterskov Eilersen, Denmark  
Jorgen Holst, Denmark  
Didier Lacroix, France  
Nelson Goncalves, France  
Frederic Walet, France  
Philippe Pons, France  
G Hundhausen, Germany  
Juergen Krieger, Germany  
Christoph Zulauf, Germany  
Athanasios Saramourtsis, Greece  
Pietro Baratono, Italy  
Massimo Schintu, Italy  
Massimo Guarascio, Italy  
Hideto Mashimo, Japan  
Ben Van Den Horn, Netherlands  
Jelle Hoeksma, Netherlands  
Ana Maria Meira, Portugal  
Antonio Pinto Da Cunha, Portugal  
Stojan Petelin, Slovenia  
Bernt Freiholtz, Sweden  
Robin Hall, UK

Corresponding members:

Roberto Arditì, Italy  
Alexandre Debs, Canada  
Alan Johnson, UK  
Erik Norstrom, Norway  
Pavel Pribyl, Czech Republic  
Jesus Rohena, USA  
Daniel Wood, USA

Programme:

- Investigate an integrated approach to road tunnel safety
- Study the application of risk analysis
- Promote and follow-up policy on dangerous goods in tunnels
- Investigate tools to apply safety principles and responsibilities

Meetings:

- Lyon, France September 2004
- Prague, Czech Republic February 2005
- Ljubljana, Slovenia June 2005
- Thessaloniki, Greece September 2005
- Rome, Italy January 2006
- Wien, Austria June 2006
- Stockholm, Sweden September 2006
- Lausanne, Switzerland March 2007

1.4. Working Group 3: Human Factors for Tunnel Safety

Leader:

Evert Worm, Netherlands

Active members:

Otto Ludwig, Austria  
Pierre Schmitz, Belgium  
Mirko Novak, Czech Republic  
Petr Bouchner, Czech Republic  
Jean-Michel Vergnault, France  
Marc Tesson, France  
Eduardo Angelozzi, Italy  
Giampiero del Pinto, Italy  
Marieke Martens, Netherlands  
Ben Rigter, Netherlands  
Hans Madsen, Norway  
Ruggero Ceci, Sweden  
Wallter Steiner, Switzerland  
Andy Evans, UK

Corresponding members

Alexandre Debs, Canada  
Jesus Rohena, USA

Programme:

- Better understand user behaviour in tunnels
- Improve user behaviour
- Improve emergency team behaviour

Meetings:

- Utrecht, Netherlands      September 2004
- Göschenen, Switzerland    January 2005
- Göteborg, Sweden          April 2005
- Salzburg, Austria          September 2005
- Decin, Czech Republic      January 2006
- Tromsø, Norway              June 2006
- Conwy, North Wales        September 2006
- Rome, Italy                     January 2007

### 1.5. Working Group 4: Detection, Communication, Safety Equipment

Leader:

Urs Welte, Switzerland

Secretary:

Tony Rock, United Kingdom

Active members:

Gerhard Eberl, Austria

Jorgen Holst, Denmark

Nicolas Farges, France

Wolfgang Baltzer, Germany

Salvatore Giua, Italy

Seiya Tazawa, Japan

Ben Rigter, Netherlands

Harald Buvik, Norway

Manual Romana, Spain

Torsten Bergh, Sweden

Martin Kelly, United Kingdom

John Buraczynski, USA

Corresponding Members:

Igino Lai, Italy

Stojan Petelin, Slovenia

Alain Jeanneret, Switzerland

Gerald Dolby Gray, United Kingdom

Programme:

- Study international harmonization of safety facilities and signage
- Review improved means to detect incidents, alert and guide users

Meetings:

- Zurich, Switzerland August 2004
- Madrid, Spain April 2005
- Salzburg, Austria September 2005
- Decin, Czech Republic January 2006
- New York, USA November 2006
- Lyon, France April 2007

## 1.6. Working Group 6: Ventilation and Fire Control

### Leader:

Art Benelius, USA

### Secretary:

Norman Rhodes, United Kingdom

### Active members:

Arnold Dix, Australia

Peter Sturm, Austria

Eddy Jacques, Belgium

Willy De Lathauwer, Belgium

Arthur Kabuya, Belgium

Wei Liu, China

Miodrag Drakulic, Croatia

Jan Porizek, Czech Republic

Miroslav Novak, Czech Republic

Rune Brandt, Denmark

Marko Jarvinen, Finland

Francois Dupont, France

Pierre Carlotti, France

Alfred Haack, Germany

Dieter Tetzner, Germany

Roberto Arditi, Italy

Carlo Barbetta, Italy

Vincenzo Ferro, Italy

Massimiliano Fresta, Italy

Katsuhiko Iwai, Japan

Hans Huijben, Netherlands

Ruth Gunlaug Haug, Norway

Joao Viegas, Portugal

Stojan Petelin, Slovenia

Samuel Estefania Puebla, Spain

Ignacio Del Rey, Spain

Tomas Sandman, Sweden

Martin Allemann, Switzerland

Jesus Rohena, USA

### Corresponding Members:

Alexandre Debs, Canada

Franz Zumsteg, Switzerland

Programme :

- Investigate pollution inside tunnels and at portals
- Study operation strategies for tunnel ventilation
- Assess fixed fire-fighting systems
- Review design fire size data
- Review pavement behaviour

Meetings:

- Lyon, France                      October 2004
- Madrid, Spain                     January 2005
- Las Vegas, USA                  June 2005
- Lisbon, Portugal                  September 2005
- Helsinki, Finland                 January 2006
- Prague, Czech Republic        May 2006
- Brussels, Belgium                September 2006
- Zagreb, Croatia                  February 2007

## 2. PRODUCTS

### 2.1. Publications

In co-operation with the International Tunnelling Association (ITA-AITES), C3.3 published a special issue of the PIARC journal Routes/Roads devoted to "Fire safety in Tunnels" (No. 324 - October 2004). This issue included the following articles drafted by, or with the participation of, C3.3 or Working Group members:

- Introduction
- Tunnel safety is quickly progressing thanks to cooperative efforts
- A comparative analysis of the Mont Blanc, Tauern and Gotthard tunnel fires
- The role of PIARC Technical Committee C3.3 in fire safety in tunnels
- The latest PIARC road tunnel fire and smoke control publication
- PIARC design criteria for resistance to fire for road tunnel structures.

Other articles in the same special issue presented ITA and their role in fire safety in tunnels, their guidelines for structural fire resistance of road tunnels, the activities of the United Nations Economic Commission for Europe to promote safety in tunnels, the new European Directive 2004/54/EC on road tunnel safety, safety in railway tunnels (the current recommendations of the International Railways Union and European regulations), preventing and combating fires in metro systems as seen by the International Union of Public Transport, and finally European research / development projects and thematic networks involved in making tunnels safe and reliable.

Articles were also published on behalf of C3.3 by members of its working groups in other issues of Routes/Roads:

- Quantitative risk assessment model for dangerous goods transport through road tunnels (No. 329 – January 2006)
- Effect of pavement on fires in road tunnels (2007)

Five technical reports, which had been mainly drafted during the preceding PIARC cycle (2000-2003), were published during the cycle 2004-2007:

- Traffic incident management systems used in road tunnels (WG 4 - 2004)
- Cross section design for bi-directional road tunnels (WG 4 - 2004)
- Road tunnels: Emissions and air demand for ventilation (WG 6 - 2004)
- Good practice for the operation and maintenance of road tunnels (WG 1 - 2005)
- Systems and equipment for fire and smoke control in road tunnels (WG 6 - 2007)

Seven new technical reports were drafted by the working groups, discussed and approved by C3.3 and finally submitted for publication prior to the Paris World Congress:

- Guide for organising, recruiting and training road tunnels operating staff (WG 1)
- Integrated approach to road tunnel safety (WG 2)
- Risk analysis for road tunnels (WG 2)
- Human factors and road tunnel safety regarding users (WG 3 and 4)
- Direction signing on a route incorporating tunnels (WG 4)
- Road Tunnels: A guide to optimising the air quality impact upon the environment (WG 6)
- Road Tunnels: An assessment of fixed fire fighting systems (WG 6)

Another six new technical reports were drafted by the working groups and discussed by C3.3 but could not be published before the Paris World Congress:

- Recommendations to owners and operators of urban tunnels (WG 1)
- Tools for road tunnel safety management (WG 2)
- Management of the operator - emergency teams interface in road tunnels (WG 3)
- Lay-bys and emergency stations in road tunnels (WG 4)
- Video detection in road tunnels: benefits and limitations (WG 4)
- Road Tunnels : Operational strategies for ventilation (WG 6)

## 2.2. Seminars

C3.3 organised two seminars in developing or transition countries, which were held after a committee meeting:

- An international seminar on “Operation and Safety of New and Existing Road Tunnels” was held at San Juan, Argentina on 29/30/31 March 2006 with more than 100 participants;
- An international seminar on “Road Tunnel Operations Management and Safety” was held at Chongqing, People’s Republic of China on 18/19/20 October 2006 with some 200 participants.

## 2.3. Workshops

C3.3 organised workshops after two of its meetings:

- Workshop on “Road Tunnel Safety and Air Quality” at Sydney, Australia on 26/27 May 2005);
- Workshop on “Road Tunnel Operation” at Tokyo, Japan on 6/7/8 June 2007.

Working group 6 contributed to two workshops. These were at:

- Las Vegas, USA on 6/7 June 2005,
- Zagreb, Croatia on 8/9 February 2007.

A joint research project on the “Transport of dangerous goods through road tunnels” was undertaken by OECD (Organisation for Economic Cooperation and Development) and PIARC which resulted in the production of a Quantitative Risk Assessment (QRA) and a Decision Support Model (DSM) softwares. These is now advertised on the PIARC website and sold directly through PIARC. A two day workshop and training session was held in February 2007 in Paris, France.

## 2.4. Other products

The pre-existing co-operation between PIARC and the International Tunnelling Association (ITA-AITES) was enhanced with the signature of a Memorandum of Understanding between the two associations in 2005. This aims at ensuring that the activities of the two associations are complementary in the field of road tunnels so as to favour synergies and avoid redundancies; it plans reciprocal participation in and promotion of the activities, as well as joint activities.

Several members of C3.3 and its working groups continued to work upon various research projects funded by the European Union, which have reached a conclusion during the last cycle. These include:

- Fires in Tunnels (FIT) concluded in February 2005. This was a European thematic network which essentially aimed to move towards a consensus on fire safety in tunnels and facilitate the exchange of knowledge gained from current practice and research.
- Upgrading of existing Tunnels (UPTUN) concluded in August 2006. This extensive research project investigated cost-effective, sustainable and innovative upgrading methods for fire safety in existing tunnels.
- Safety in tunnels (Safe T) concluded in May 2006. This was a European thematic network on safety in tunnels, launched in 2003 in order to develop European guidelines for the safety of existing tunnels.

In order that the progress made with regard to these research studies is not lost, but further developed, the main partners sought a way of continuing networking activities. This resulted in a new Committee inside ITA and actively supported by PIARC. This Committee on Operational Safety in Underground Facilities (COSUF) was officially created in May 2005.

## **STRATEGIC THEME 3**

### **TECHNICAL COMMITTEE ON WINTER MAINTENANCE (3.4)**

#### **2004 – 2007 ACTIVITY REPORT**

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## **COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES**

### Issue 3.4.1 Winter Maintenance and Road User Information Systems

Charpentier, Canada-Québec

Members:

Marchetti, France

Pisano, USA

Ölander, Sweden

Delannoy, Canada

Hanke, Germany

Kajiya, Japan

Hughes, USA

### Issue 3.4.2 Sustainable Winter Maintenance Maintenance Contracting Study

Giloppé, France

Team:

Charpentier, Canada-Québec

Roelants, Belgium

Tsudaka, Japan

Nelson, USA

### Second Edition of Snow and Ice Data Book

Cocu, Belgium

Team:

Ishimoto, Japan

Roelants, Belgium

Hernadi, Hungary

Hobbs, UK

Prévot, Belgium

Frank Rizzardo, Canada

### Focus on Environmental Considerations

Schlup, Switzerland

Team:

Prévot, Belgium

Ölander, Sweden

Delannoy, Canada

Cerne, Slovenia

### Issue 3.4.3 Share Knowledge Congress Scientific Programme March 2

Öberg, Sweden

Team:

All TC 3.4 members Winter Maintenance Seminar September 2005

Lacis, Latvia

Team:

Mrs. Öberg, Sweden

Mr. Giloppé, France

Mr. Prévot, Belgium

Mr. Männik, Estonia

## SUMMARY

Ice and snow on streets, roads, pavements, sidewalks and cycle paths cause problems for users and require maintenance actions. Such actions influence safety, accessibility, mobility and vehicle cost. Winter maintenance operations also impact our environment. Consequently, it is essential to develop effective strategies and methods for maintenance actions and to document different winter standards. It is also important to develop methods for efficient measurement of the standards achieved. A strategic objective is to make the contractors understand the area contracts as a maintenance service contract and the road users as customers.

### *Support systems and information*

In reality, today's challenge is no longer to put together road weather information networks, but rather to optimize the use of the large mass of data for tracking operations in real time and developing decision and management support tools.

Moreover, the need for standardization, data sharing, and the development of operations and management support systems depend on initiatives that spotlight international harmonization. The points that countries share in terms of the issues involved in developing road weather information systems are the main justification for the desired sharing of data on best practices, over and above simple data exchange, so as to meet the needs of roadway users.

### *Contract*

The organizational mode of the activities of winter maintenance (private public, articulation planner, main contractor, operator) differs notably between the countries.

It is necessary to know the climate and the road consequences of weather, in order to know the amplitude of the phenomena and to determine what must be inserted in a contract. The levels of service must be very clearly defined and well understood by all partners. The check procedures in particular for the road condition are to be developed by establishing indicators and methods of measurement. Which indicators are best adapted? It is difficult to know which is the best approach to define the levels of service, prescribing the specific methods or specifying objectives.

It is almost impossible to compare costs and to determine which is the optimal mode of remuneration for these types of services.

### *Snow and Ice Control Data book – Edition 2006*

Available and safe roads during the winter – demographic and climatic constraints – costs and benefits regarding safety, mobility, environment – human, material, equipment means – private partnership – decision support systems: these are the main parameters of today's "winter road maintenance equation". All included in the data book but each country uses its own set of methods to reach the goal.

### *Environment*

A life cycle assessment of the environmental impacts of spreading materials showed that less than half of the environmental impact was generated by the products when spreading

salt and abrasives. Other impacts are energy and vehicle emissions, production and transport of materials.

Important activities start at the design of the road and further comprise drainage and rainwater management, depots, equipment, salt management, training and communication. So winter road needs to begin at the road planning stage: think winter maintenance at every stage of planning a road!

## 1. THE WORK PROGRAMME AND ORGANIZATION

Issue 3.4.1 Improve Winter Maintenance and Operational Information Systems	
<i>Strategies</i>	<i>Outputs</i>
Optimize the decision making process and the use of decision aid tools (eg. Road Weather Information Systems 'RWIS' and Maintenance Decision Support Systems 'MDSS').	Links to other organizations working on the definition of sound siting, calibration and other standards/guidelines for RWIS, exchange of ideas/approaches, and encouragement of international harmonization.  Synthesis of activities and recommendations in the area of winter maintenance decision support aids and approaches.
Promote the sharing of pertinent winter operations data (eg. RWIS data etc.) across jurisdictions.	Report identifying barriers to free and open exchange and proposing steps/process to facilitate sharing (eg. engaging own organization and others to provide information in support of mobility and user needs).
Issue 3.4.2 Provide Sustainable Winter Maintenance	
Analysis of public and private sector roles in the delivery of optimal winter road maintenance services.	Survey report on contracting. (May be included in the next edition of the Snow and Ice Data Book.)
Update the review of winter road maintenance practices around the world. Include the context and extent of customer orientation in the conduct of winter road maintenance operations.	Second edition of the Snow and Ice Data Book. Include examples and comparative approaches to the inclusion of user needs in winter road maintenance.
Explore sustainability of winter road maintenance practices with particular focus on balancing environmental impacts with mobility and safety considerations.	Main topic specifically on the 'Environment' for the XIIth International Winter Road Congress.
Issue 3.4.3 Share Knowledge	
Prepare the scientific programme for PIARC's XIIth International Winter Road Congress to be held in 2006 in Torino-Sestriere.	Congress technical programme and proceedings. Congress programme to include session Chair formal report presentations prior to closing ceremonies.
Assist developing countries and countries in transition with their winter maintenance programmes.	Conduct a winter maintenance seminar in Riga, Latvia in the September 2005 time frame.

## 2. OUTCOME OF THE WORK OF THE COMMITTEE

The challenges of the today's winter road maintenance are the focus of TC 3.4's work resulting in the following reports on the State-of-the-Art.

### 2.1. Winter maintenance support systems and information exchange

In most countries where winter affects road traffic conditions, information systems have been installed to improve winter road maintenance operations. Primarily made up of atmospheric and road sensors, the data gathered is used to provide support for decision making and management.

The report, written in the context of PIARC's 2004–2007 strategic plan, was intended to provide a scan of various practices worldwide for the use of road weather condition information systems. To do so, a survey of nineteen organizations made it possible to get an overview of the many facets of data acquisition and data processing. The evolution of standardization and development of decision-making support and management optimization systems were among the areas that were spotlighted. Then, the latest literature was selected, referenced and grouped in themes in order to give readers the opportunity to document their interests more easily.

The work done shows that there are, nonetheless, many common points among the countries, even though their circumstances may differ in terms of climate, geography, economy and, in particular, in terms of infrastructure (characteristics of the road network). Among the similarities is the issue of obtaining standardized data. In fact, for many road weather systems, the difficulty lies in getting reliable information. Selecting measuring instruments, especially road sensors, is not a straightforward task given that standards still need to be developed to define their characteristics and performance (several initiatives are now underway regarding road sensors). What's more, once installed, the sensors are not always subject to regular maintenance and calibration, which can affect the accuracy of the measurements. Existing standardization in this regard is more or less precise, depending on the country, and occurs at various levels: within a road authority for a region of a country, at the national level, and sometimes at the international level. The standardization component is primordial, as the reliability of the data provided by road weather information systems predetermines the quality of decision support or management support systems. Standardization is also what makes it possible to share data among separate networks.

Data sharing is another important component, one which is also closely tied to standardization, if only with respect to the definition of data exchange protocols. Currently, a wide variety of file formats is used for transferring data from entity to entity, with some formats offering more benefits in terms of universality, or ease of reading and processing. From a broader perspective, the key requirement of information sharing involves the delivery of the measurements taken to meteorological services with the goal of obtaining a forecast of road weather parameters. However, it is also essential to share data among organizations in the framework of road users' mobility needs, in order to give them continuous news throughout their journey. This approach, which is desirable at both the national and international levels given how open borders are, probably requires the interchanges to be formalized, perhaps even an agreement among road organizations. To contemplate information being pooled among different entities, some non-technical roadblocks could be identified, such as the differences between the types of roadway organization and between their objectives.

Finally, another point that the various countries have in common has to do with the need to optimize use of the data provided by road weather stations. In fact, the study, which examined all initiatives worldwide via a survey and literature review, shows that there are varying degrees of data exploitation. Depending on the organization, the measurements taken by the sensors are sometimes simply posted, with interpretation left up to the user; in other cases, the data flow into a process for forecasting road weather parameters, or are used by decision or management support systems. However, the issue of these systems' cost-effectiveness remains to be precisely quantified: improving the operational process and variation in costs often have to do with a set of changes, not to mention the fact that it is hard to compare one winter with another. Some management tools, such as winter severity indexes, are especially difficult to develop due to the number of parameters that have to be considered and the variation in road weather conditions over a territory.

In reality, today's challenge is no longer to put together road weather information networks, but rather to optimize the use of the large mass of data for tracking operations in real time and developing decision and management support tools. What is crucial is, based on the specific features of the organizations, to establish the investment threshold at which relevant data will begin to improve winter road maintenance operations.

Moreover, the need for standardization, data sharing, and the development of operations and management support systems depend on initiatives that spotlight international harmonization. The points that countries share in terms of the issues involved in developing road weather information systems are the main justification for the desired sharing of data on best practices, over and above simple data exchange, so as to meet the needs of roadway users.

Contents of the communication:

Results of the survey

- System components and data capture
- Data processing and usage

Supplementary analysis

- Installation and development of RWIS
- Different uses for RWIS
- The RWIS of tomorrow

## 2.2. Report of a survey on winter maintenance contracts

The manufacturing sector today, largely manages its' production operations with greatly reduced inventories. The requirement for 'just-in-time' delivery to support such an approach has placed greater demands on the transportation sector. Meeting the greater needs of road users within the constraints of public finances remains a difficult challenge but is one which must be met by the responsible organizations.

The characteristics of the winter season and the specific winter weather phenomena, even within the same country, can vary considerably from region to region and from winter to winter. This makes winter road maintenance programmes rather difficult to administer.

A public winter road maintenance service can be assured in various ways, however, the mission remains comparable whatever the nature of the responsible organization. Whether the services are provide in whole or in large part by the public sector or private companies, it is essential that the roles reserved for each partner be very clearly defined.

This is why the establishment of pseudo-contractual links within an administration or legal contracts between a road administration and private companies is necessary to the ensure winter road maintenance services.

The work completed within the framework of the PIARC 2004-2007 Strategic Plan is not exhaustive. It provides a preliminary review of existing practices, considers their merits, and lays the ground work for a more complete understanding later on. A survey was carried out within Technical Committee 3.4 using a questionnaire covering some 50 topics. 23 completed questionnaires were received from 11 countries. However a number of committee members cautioned that with winter road maintenance being done entirely outside of their organization, it was difficult to provide complete and satisfactory answers to some of the questions posed.

Concerning the organization of winter road maintenance services, it was noted that the distribution of responsibilities between mandated entity, management, and operators could differ significantly from one country to another. In the majority of cases, the mission entrusted by the responsible organization (mandate holder) on a single entity included management and operations (this remains true whether a government entity or the private sector). (Readers are cautioned however that some countries did not answer because they did not feel that certain responsibilities could be appropriated delivered by contracting out.)

A majority of contracts (70 %) refer to a level of service with, in half of the cases, these service levels being made generally available to the public and road users. However these levels of service are, in many cases, only vaguely quantifiable. Many contracts take the approach of specifying required numbers of operators, competencies and qualitative and quantitative levels of equipment and materials.

Where operations are specified, few contracts (24 %) refer to particular methods.

The terms of payment can vary considerably as well with the two more common being payment for work at a fixed price or by hourly rates.

Some mechanisms have been developed to take the variability in winter severity and the difficulties in programming winter maintenance activities into account.

One such approach is to use a winter severity index designed to correlate well with winter road maintenance operations. Another is the use of no-claims bonuses or penalties based on the quality of the services provided.

Control methods differ depending on the objectives and the meteorological phenomena. Control can be simply an a priori audit of the organization, its installations and procedures to assess its ability, based on ratios, to meet the objectives.

Controls can also be applied after the fact and based on the resultant level of service achieved as for example through the use of friction measurements. Independent organizations can be called upon to conduct the quality control checks.

In the majority of the cases several control methods are used.

The principal conclusion which can be drawn from this analysis is that contracting for winter road maintenance services is very challenging!

The specific approach to winter road maintenance (private public split, management approaches, main contractor, operators) differs significantly between countries rendering any analysis a complex exercise. But a number of interesting opportunities to improve things does nevertheless emerge.

First of all it is necessary to have an excellent grasp of the climatology and the winter weather phenomena of the region in order to correctly assess their impacts on the road and to establish appropriate contract criteria. It is especially important to define those extreme weather limits beyond which the level of service simply cannot be reached.

The levels of service must be very clearly defined and well understood by all of the partners and stakeholders.

The quality control procedures in particular must be carefully developed with clear indicators and precise methods of measurement.

Another basic requirement is to precisely quantify and document as many of the standards and other information as possible.

This preliminary survey could not truly compare the relative effectiveness of the various contracting approaches it documented and so many questions remain.

For example, no recommendation can be made regarding the optimal approach for the definition of levels of service; prescribing the maintenance techniques to be used or defining road state objectives.

It is not possible to compare the relative costs of various approaches or even to determine which method of payment is most effective for these services.

Finally questions remain regarding the quality control methods; should these emphasize service organizational structure and approaches or post-treatment monitoring of resultant road conditions?

Winter road maintenance is a field which is ripe for further study in a large number of areas not the least of which is contracting approaches. The entire community of practice faces many of the same types of problems making it possible, based on the collective actual operational experience, to establish some theoretical recommendations.

### 2.3. Snow and Ice Control Data book – Edition 2006

#### *Origins, Objectives and Methodology*

A Snow and Ice Data Book was first published as an interim report in conjunction with the XIth International Winter Road Congress, 2002, Sapporo, Japan. Considering the usefulness of this first issue to support the exchanges of experiences between international experts the PIARC Executive and TC3.4 decided to pursue this initiative and stated that future efforts should be directed at documenting practices in additional countries as well as adding topics on economic and environmental issues, public-private partnerships, training, road user needs and finally emerging technologies.

The update was prepared for the XIIth International Winter Road Congress, 2006 in Torino-Sestrière, Italy with 22 technical contributions.

#### *Assessment of the Snow and Ice Control Measures*

The cost and benefit of winter road maintenance activities is given prominence in the databook with summaries provided of measures introduced in recent years to minimise the use of de-icing materials. These include the measurement of efficiency both on an internal and external basis, and the use of performance indicators.

Winter indices correlate winter activities and costs to winter severity or winter events. Where winter road maintenance is contracted out such indices are also useful for setting up tenders and monitoring performance. However no international classification system (with a few maintenance-specific indices applied to some representative climate stations in each country) is yet available to report objectively and coherently on the climatological characteristics that are important in terms of winter maintenance.

Cost effectiveness is also discussed in the document – for instance the challenge of providing an efficient winter maintenance service on a long and lightly trafficked network which unavoidably leads to a relatively low level of cost effectiveness.

Environmental issues are widely covered including how to achieve the joint goals of reducing costs and environmental impact whilst maintaining service levels. The challenge is to implement measures to decrease the use of de-icing products, leading to cost reductions, whilst maintaining service levels and saving the environment.

The importance of keeping comprehensive historic records is highlighted. It is also essential that technical equipment is accurately calibrated prior to the start of the winter maintenance period to ensure correct application rates of de-icing materials and that the fleet is kept in good working order.

Many entries cover the necessity, where the service is contracted out, of monitoring the performance of private contractors, to ensure the quality of the services provided. Road user feedback has proved to be valuable in service assessment. Findings from user surveys are taken into account when the winter maintenance strategy is reviewed and updated.

### *Traffic Safety and Road Users Information*

A majority of countries highlighted the importance of sharing of information about road conditions with drivers, traffic information centres and various media organizations. Traffic (information) centres which operate 24 hours a day have been set up in a number of countries. They disseminate real time information to road users by various means including radio, websites and Variable Message Signs (VMS). VMS are used to give a range of information including in many cases road and air temperatures, road closures and recommended diversion routes, wind speed, weather forecasts and general road conditions. Reduced speed limits come into operation in some countries if the road is slippery or snow is present.

The dissemination of information is not restricted to national boundaries. Five countries in the Baltic Sea Region have set up a cross border road information project.

Educating road users is also most important and there is a growing use of media campaigns to encourage road users to be careful by increasing their awareness of the inherent risks of winter driving and how their driving habits need to change.

### *On-going Researches and Studies*

The reports illustrate that the latest technologies to continuously optimize winter maintenance operations are being tested by many countries by either improving the performance of the machinery or by developing the on-board equipment for vehicles involved in snow and ice control (integration of new technologies) but also through research into new spreading methods. Other major research involves the modernization and the improvement of the Road Weather Information Systems and pilot projects related to skid resistance measurement, road surface assessment, residual salt modelling and winter traffic problems.

Some administrations are engaged in a process of reflection with the aim of refocusing their role in the winter road maintenance process; (extended) public-private partnerships is in this case being considered as an alternative. Other countries which already contract with private companies to manage their road maintenance are developing their supervision and assessment methods.

#### 2.4. Winter road maintenance practises – strategies to reduce their impact on the environment.

Recently, the European Union directed that any significant and sustained upward trend in the concentration of any pollutant in groundwater should be identified and reversed by 2015. Finland reacted with a research program on "Migration of alternative de-icing Chemicals in Aquifers". Aim: to identify de-icers which have the least harmful impact on vegetation, soil and groundwater. Potassium formate was found to be the most promising alternative.

To define requirements for a new German eco-label, an ecological analysis was undertaken for different products: sodium, calcium and magnesium chloride, sodium and potassium formates, urea, gritting material. Results: undifferentiated use of formiate can not be recommended, despite its very low aquatic toxicity and the fact that it's easily biodegradable, because of its very energy-intensive production.

A life cycle assessment of the environmental impacts of spreading materials showed that in Munich half of the environmental impact was generated by the actual spreading operations themselves for salt and abrasives, including energy and vehicle emissions. One third of the impacts were made up by production and transport of gritting materials. In Nuremberg, where an energy intensive gritting agent was used, two thirds of all impacts originated from the production process. Conclusion: final judgements can only be made after careful assessment of the entire process.

Thawing agents and the trucks used to spread are both sources of pollution. International regulations and manufacturer policies require efforts in developing environmentally friendly engines and vehicles. The manufacturers focus lies on fuel consumption, exhaust emissions, noise, durability, recycling and savings in material and energy resources.

Administrations are striving to improve winter maintenance to minimize the salt consumption. Yet the efficiency of such changes in strategy is not known unless the impact on groundwater is investigated.

Sweden is now developing an appropriate tool: an automated system for monitoring groundwater salinity or "Electronic Tongue", based on a system for monitoring frost depth by wireless communication.

In a Finnish groundwater supply region salting was reduced by half and the quality requirements for friction were simultaneously reduced from 0.30 to 0.25. No changes in the number of road accident were registered and the majority of the wells showed a stabilization or a decrease in chloride concentration.

Novelties: trials were made with an agricultural by-product as an additive to rock salt in the UK. It showed a significantly lower level of apparent corrosion by the end of the season. Sweden added a sugar product to a salt solution in order to find out whether a certain amount of the salt could be replaced by this additive. The trials will be continued to get all the answers and the environmental impacts will be studied.

Other tests added tenside to the salt brine with the following results: surface dries faster, fluid creeps easier down into the pores of the asphalt, and no effect on friction.

Norway compared brine of sodium chloride and of magnesium chloride and found a tendency towards less salt consumption with the magnesium brine without reducing

friction. A tendency towards increased friction values was found at temperatures below -6°C.

Japan showed that only 5 % of the salt spread reached the cultivated areas. Result : the tolerance threshold for one of the most salinity intolerant plants (the cucumber) was only exceeded at one point.

Also in Japan, in a laboratory test, the impact of chlorides on the growth of fruit trees was established confirming that there was little impact variation between the constituents of anti-icing chemicals but a great difference in their concentrations and that plants are more susceptible to anti-icing chemicals when the plants enter their active phase, end of winter.

Lithuanian traffic is increasing and also the use of salt. An investigation showed that with the use of salt the traffic safety was improved and on the salt itself (content of moisture, chlorides and sulphates) that the quality requirements were met by all samples taken.

Every year, large quantities of polluted snow are dumped into Norwegian rivers. To estimate the impact on pollution distribution in the water and in the river sediment, simulations with mathematical models were undertaken: it was determined that there was only a low probability that snow dumping will significantly pollute rivers or fjords.

Another Norwegian study concerned a tiny lake and the effects of sodium chloride on the circulation properties of the lake water. Although the populations of zooplankton and fish seemed to be little affected by the pollution, biologists feared that if more salt comes into the lake, the water stability will increase.

For storm water discharge on a French motorway, settling tanks have been installed. Purpose: reduction of peak flow, decantation of solid materials, containment of floating waste and hydrocarbons, settling of accidental pollution and supervision of discharge qualities.

Belgium compared two storm-water basin sites in three aspects: interaction of collected water with the concrete structure, water-mineral reactions in the basin and seepages of water from the basin into aquifer.

Recommendations were made on the choice of concrete and management of the basin.

For new Swedish roads, the strategy is to leave in situ the cultural layers not directly affected rather than to excavate the entire layer. It is assumed that the soil protects the archaeological artifacts far better than the museum. Yet, excavated metal artifacts show greater deterioration than those excavated before, implying that recent pollution is responsible for accelerating the corrosion, probably by chloride-based de-icing chemicals.

Sweden used a road simulator to investigate the production of inhalable wear particles from pavement which can cause serious respiratory problems.

Important activities start at the design stage of the road and further comprise drainage and rainwater management, depots, equipment, salt management, training and communication. So winter road maintenance begins at a road's planning stage:

- Think winter maintenance at every stage of planning a road.
- A project has to take into account the exposure of the road. Plentiful sunshine on its surface allows a marked reduction of salt use.

## 2.5. Sharing Knowledge

### Report from the Riga Seminar

The international seminar on Safe and Efficient Winter Maintenance Practices was held in Riga, Latvia on September 22 and 23, 2005. The seminar was planned as a regional event in cooperation with PIARC TC 3.4 – Winter Maintenance, the Baltic Road Association and the Latvian State Roads and it focusing on the Baltic states, the neighbouring Scandinavian countries, Russia, Belarus and the Ukraine.

The seminar's aims were to:

- present an overview of the current state of winter maintenance,
- understand needs and difficulties of Latvia and neighbouring countries,
- confirm the objectives and work program set for TC 3.4.

The main focus of the seminar was the management of winter maintenance operations, contracting, safety and environmental aspects.

Interest from experts and managing engineers was high as evidenced by the fact that the seminar brought together some 150 participants from 21 countries.

Mrs. Gudrun Öberg – the Chair of the TC 3.4 Winter Maintenance Committee, presented the PIARC Strategic Plan and the work programme for TC 3.4.

The session “Management and Standards” introduced that the Baltic region with a total population of 7.1 million people and 58 thousand kilometres of state roads. Winter weather conditions are very changing, influenced by Atlantic cyclones and Artic anticyclones, and are comparable with conditions in southern Finland.

During the last fifteen years, road administrations of the Baltic states worked hard to transform road management from the Soviet socialist style to modern more market oriented approaches. The close cooperation between the Nordic Road Association and the Baltic Road Association, technical assistance and support from the Nordic countries as well as technology transfer from the USA all played important roles in this process.

Performance specifications for winter road maintenance in the Baltic countries are set on the same bases and principles as in Sweden and Finland. All Baltic countries are using road weather information systems, developing their own road user information centres and cooperating with Finland in a common system Baltic Roads Net system.

The session on “Contracting” introduced the situation not only in the region but also around the world with an analysis of public and private sector roles in the delivery of optimal winter road maintenance.

Three different models of winter road maintenance management in the Baltic countries were presented. Lithuania has 11 state enterprises, one year contracts, and no competition. Latvia is contracting out 100% of the maintenance work in open tenders with the result that four separate five year contracts were won by state owned joint stock companies. Four very large contract areas with approximately 5000 km each does not stimulate competition. In the new plan for a seven year contracting period from 2007 to

2014 the network is divided into 12 areas of about 15 hundred km each. Estonia has developed a system. 63% of the maintenance works is contracted out with 56% being done by private companies, but 37 % of the maintenance is assured by the state agency.

The session on “Environmental Aspects” showed that the road administrations of the Baltic countries together with their contractors were using proven and testing new methods to minimize the negative impact of de-icing chemicals. Wet salt technology is widely used for roads with high traffic volumes. Contractors’ performance monitoring, new tools for salt distribution control on roads, experiments on pre-wetting salt with hot water and sugar brine (glucose, fructose) and heated sand use on low volume roads were reported on in the presentations from the Nordic countries.

The Seminar included a technical tour conducted in the Central and North-Eastern part of Latvia. Participants had an opportunity to see the newest contractors’ winter maintenance base at Neceri near the Riga Hydro Power Station and to attend the presentation of the biggest contractor “Central Region Roads” just inside the salt storage shelter. A captivating film was presented showcasing Latvia’s machinery operatorstraining competitions.

Conclusions:

- Chlorides (NaCl and CaCl<sub>2</sub>) are and will remain the basic de-icing chemicals for roads with high traffic volume in the region.
- Existing Road Weather Information Systems in Baltic countries do not measure the precise use of chemicals for de-icing, significant improvements are needed in near future.
- Some chloride-free anti-skid treatments need to be tested on low volume roads.

PIARC XIIth International Winter Road Congress 2006.

The Technical Programme was divided into six Topics. A total of 130 documents from 18 countries were presented. Japan distinguished itself once again with the number of papers it presented.

Topic I – strategies, levels of service and standards

Topic II – performance and financing

Topic III – safety and mobility in winter

Topic IV – environment

Topic V – winter maintenance management systems

Topic VI – snow and ice control technologies

Some new aspects from previous years and reported in the Winter Road Congress 2006 will be highlighted. Some are quite new while others build on earlier results.

- Think winter maintenance at every stage of planning a road!
- Out-sourcing of winter road maintenance continues to expand to more countries. There is now a need to concentrate on contractor performance monitoring. Requirements must be clearly set and measurable.

- Socio-economic models are needed to assess the consequences for road users, road administration and the society at large of changes in strategies in winter road maintenance.
- Cost-Benefit-Analysis of winter maintenance in pedestrian areas show that the accident costs are much higher than maintenance costs.
- The full life cycle assessment of the environmental impacts of spreading materials including also fuel consumption, emissions, noise, durability, recycling, energy use in manufacture etc. need to be refined. So final judgements can only be made after analysing the whole process.
- Partnerships between road administration and road user need to be nurtured.
- The addition of sugar (glucose, fructose) to salt spreading is being trialled to determine whether a certain amount of the salt could be replaced by this additive.
- The spreading of sand with hot water (95°C) is being used to extend the staying power of sand on frozen roads
- Remote friction sensing is being pursued.
- Enormous development is taking place in the areas of Road Weather Information Systems and Winter Maintenance Management Systems that integrates many different types of information to support transportation operations, including administration, crew call-outs, operations, and documentation.
- A new Electronic Tongue is being developed to constantly monitor in-situ levels of chlorides based on a system for monitoring frost depth by wireless communication.
- Concerns about effects of salt on buried archaeological artefacts are growing in some countries.

In spite of the numerous distractions; technical tours, visits, equipment displays etc. available to Congress attendees, the technical sessions were very well attended. It can be concluded that there is no single combination of winter road maintenance approaches suitable universally for all countries. There are simply too many climatic, societal, economic, and other environmental considerations. However, sharing knowledge and learning from each other certainly can lead to significant savings in time and precious resources.

Based on the experiences, the International Winter Road Congresses continue to be premier world forums for the international exchange of information. A final sincere wish; that to facilitate technology transfer, road administrations and their service provides employ, wherever possible, open systems design principles. In closing, we hope that the Congress till bring us all a little closer to achieving the Congress' main them 'keeping road users on the move in winter'.

## 2.6. Recommendations for future R&D areas

Many areas deserve attention in the future. Both in the areas listed above under the title news and in areas where development has continued for many years already but also in quite new areas. Stimulating topics are listed below:

- The use of weather and road condition related traffic management and information systems including the use of the newest technologies.
- The application of Winter Maintenance Management Systems on the strategic level and the tactical (day-to-day) level.
- Climate change – its' impacts and pro-active management to mitigate the impacts.
- The on-going development of spreading methods.
- Study of traffic safety including also pedestrian safety.
- Finally, how to share knowledge in an efficient way.

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Issue 3.4.2

# **STRATEGIC THEME 4**

## **QUALITY OF ROAD INFRASTRUCTURE**

### **DETAILED ACTIVITY REPORTS**

#### **2004-2007**

Anne-Marie Leclerc (Canada-Québec)  
ST4 Coordinator

The Strategic Theme entitled “Quality of Road Infrastructure” brings together a variety of experts from various fields who are mobilized around a joint objective: to improve the quality of road infrastructure through effective management of road infrastructure assets in accordance with the expectations of users and residents, and with managers’ requests.

These experts must address the following question: How well do existing and projected road infrastructures meet the requirements of road infrastructure managers?

ST4 comprises five Technical Committees, as listed below. The work of each committee revolves around three main issues that are defined in the PIARC strategic plan:

#### **TC4.1 Management of Road Infrastructure Assets**

- Promoting asset management methods
- Providing integration of condition indicators for road assets as a whole
- Taking into account expectations of users and residents

#### **TC4.2 Road/Vehicle Interaction**

- Having a 20 to 30-year vision of developments in vehicle and road pavement characteristics
- Reducing road noise
- Improving the description of pavement surface characteristics

#### **TC4.3 Road Pavement**

- Selecting adequate pavement types and road techniques
- Maintaining pavements
- Minimize the impact of road works on the areas traversed

#### **TC4.4 Road Bridges and Related Structures**

- Increasing the durability and safety of structures
- Evaluating the condition of structures in connection with asset management methods
- Taking into account environmental and cultural aspects

#### **TC4.5 Earthworks, Drainage and Subgrade**

- Promoting optimal use of local materials
- Having indicators representative of the condition of geotechnical structures for road asset management
- Anticipating the impact of climate changes

Most of the Technical Committees have distributed their tasks by structuring several workgroups, normally assigning one workgroup to each issue. During the 2004-2007 period, the five Technical Committees have demonstrated a constant and dedicated effort. The following reports attest to this.

Each Committee met six to eight times during the 2004-2007 period. A two-day meeting of all ST4 Technical Committees was held in Québec City halfway through the cycle. This meeting provided an opportunity for the members of the five Technical Committees to present the progress of their efforts, and to continue with the execution of their work plans. A full day was dedicated to discussions pertaining to the common theme of road infrastructure assets. Over the course of the day, stakeholders from industries in Québec and the United States joined ST4 members to discuss the four themes related to the management of road infrastructure assets, which are listed below:

- Promoting asset management methods;
- The concept of the road corridor;
- Having indicators representative of the condition of geotechnical structures for road asset management;
- Taking into account expectations of users and residents in the coordination of road networks.

Among the achievements of the ST4 Committees, it is worthwhile to note the organization of several international PIARC seminars, some of which took place in developing countries or countries that are in the midst of transition. A few of these events are listed here:

- International Symposium on Pavement Surface Characteristics, Toronto, Canada, June 6 to 11, 2004;
- International Seminar on Monitoring and Managing Paved and Unpaved Roads Bamako, Mali, February 21 to 24, 2006;
- International Workshop: Automated Detection of Pavement Cracking, Québec, August 13, 2006;
- International Seminar on Urban Pavements, Krakow, Poland, September 2005;
- International Seminar on Road Pavement Maintenance, Havana, Cuba, April 18 to 20, 2007;
- International Seminar on Adapting Road Earthworks to the Local Environment, Iasi, Romania, May 31 to June 2, 2007.

They also made a significant contribution to the Routes/Roads journal, with the publication of five articles addressing a variety of topics, including a characterization of the skid resistance of pavements, the use of recycled pavements, urban pavements, etc. At least four other articles have been submitted for publication.

Approximately twenty additional documents were produced during this period, or are in the process of being published, including PIARC reports, guides, and survey results. The reports that have been produced cover a variety of topics. Some examples include: reducing the impact of roadwork; performance indicators; methods for increasing the durability or lifespan of bridges, etc.

Topics that are or will be covered in guides include: accidents related to the skid resistance of pavements; collecting and interpreting measurements of longitudinal and transverse evenness; methods and criteria for approving new pavements; evaluating and classifying automated equipment for measuring pavement cracking; and long-lasting pavements.

The five Committees will also have an opportunity to present their achievements during their respective sessions at the World Road Congress in Paris.

As Coordinator for Strategic Theme 4, I would like to thank all of the members of the Technical Committees who contributed to this initiative. Their contributions and dedication have enabled us to make advancements and to develop better practices.

## **STRATEGIC THEME 4**

### **TECHNICAL COMMITTEE MANAGEMENT OF ROADS INFRASTRUCTURE ASSETS (C4.1)**

## **2004-2007 ACTIVITY REPORT**

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## COMMITTEE MEMBERS HAVING CONTRIBUTED TO THE ACTIVITIES

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Number of active members: 37.

## 1. WORK PROGRAM AND ORGANIZATION

### 1.1. Methodology

#### Work responsibility

- Each issue is placed under the responsibility of a working group, directed by a Committee member and each member including secretaries. They have to join the one of the three working groups.
- All the Committee members participates the reflections and proposals about each issue.
- The working group establishes the synthesis of the reflections and recommendations, as well as the drafting of the final report relating to the issue, under the coordination of the responsibility of group.
- The Technical Committee validates the synthesis and the report of each issue.
- The Chairman coordinates the compilation of works, as well as the drafting of the reports.

## Activities

### Meeting of autumn 2004

- Each working group concentrates the documentation relating to its issue.
- The synthesis of documentation and the lacks of knowledge are presented by a member of the group in the Technical Committee.
- The synthesis and the lacks of each issue are discussed.
- On the basis of these discussions, the final synthesis about documentation and the lacks are the subject of an internal report in the Committee, and it worked out by each working group after the meeting. This report is distributed to the members of the Committee before the next meeting.

### Meeting of 2005 and 2006

- Each meeting is concentrated mainly the discussion of issue.
- Before the meeting, the working group which has the issue under consideration, discussed to establish the bases of reflection. Each Committee member also prepares the discussion.
- The working group presents its reflections.
- The issue is discussed in the Technical Committee by the way of intensive brainstorming. It took 2 half-days for this discussion.
- The working group collects the proposals and establishes a summary of the discussion after the meeting. It works out the final proposals as their contents without drafting at this stage.
- At the next meeting, the final proposals are discussed and validated by the Technical Committee.
- After the meeting, the working group writes the final report relating to the issue.

### Meeting of spring 2007

The final reports are validated.

## 1.2. Working Program

The Working program was the following:

Year	Meeting	Main Goals
2004	Spring	<ul style="list-style-type: none"> <li>• Presentation of members and organisation of Committee</li> <li>• Working program for period 2004 - 2007</li> </ul>
	Autumn	<ul style="list-style-type: none"> <li>• Synthesis of Documentation</li> <li>• Underlining the main Gaps of Knowledge</li> <li>• Preparation of 2005 Seminary</li> </ul>
2005	Spring	<ul style="list-style-type: none"> <li>• Issue 4.1.2 « Indicators » : brainstorming</li> <li>• Definitive Program for 2005 Seminary</li> </ul>
	Autumn	<ul style="list-style-type: none"> <li>• Issue 4.1.2 « Indicators » : Validation of Results</li> <li>• Issue 4.1.3 « Planning for interventions » : brainstorming</li> <li>• 2005 Seminary</li> </ul>
2006	Spring	<ul style="list-style-type: none"> <li>• Issue 4.1.3 « Planning for interventions » : Validation of Results</li> <li>• Issue 4.1.1 « Asset management » : brainstorming</li> </ul>
	Autumn	<ul style="list-style-type: none"> <li>• Issue 4.1.1 « Asset management » : Validation of Results</li> <li>• Preparation for Congress</li> </ul>
2007	Spring	<ul style="list-style-type: none"> <li>• Validation of Final Reports for the 3 Issues</li> <li>• Preparation for Congress</li> </ul>
	Autumn	Congress at Paris

The Issues refers to the Strategic Plan 2004 – 2007.

<b>Issue 4.1.1 - Promote Asset Management methods</b>		
	<i>Strategies</i>	<i>Outputs</i>
a	Identify and review methods aiming at a coordinated management of all road assets	State of knowledge in the field of asset management
b	In management systems, review how the performance of infrastructure is taken into account in terms of functionality (expected service vs. service provided; consideration of users perception, etc.)	Recommendations
c	Review the various operating structures for road asset management systems; review how the management concept per road corridor is implemented	Description of structures and recommendations

**Issue 4.1.2 - Providing integration of condition indicators for road assets as a whole**

<i>Strategies</i>	<i>Outputs</i>
Identify progress in obtaining and developing indicators reflecting the condition and functionality of road infrastructure, which can be integrated into an overall management system	List of good practice and recommendations according to the context

**Issue 4.1.3 - Taking into account expectations of users and residents**

<i>Strategies</i>	<i>Outputs</i>
Review the good practice enabling to limit the impact of interventions on infrastructure	Good practice guidebook
Review the management methods linking the various levels of road administration so as to bring decision making closer to users	Examples of good practice and recommendations

On graphical form, this program present as follows:

		4.1.1 Asset Management	4.1.2 Indicators	4.1.3 Planning for interventions
2004	Spring			
	Autumn			
2005	Spring		Brainstorming	
	Autumn		Validation of Results	Brainstorming
2006	Spring	Brainstorming		Validation of Results
	Autumn	Validation of Results		
2007	Spring	Validation of Reports		
	Autumn	Congress		

### 1.3. Meetings

4-5 may 2004	Paris FRANCE	36 members
26-28 October 2004	Brisbane AUSTRALIA	26 members
February 2005	Munich GERMANY	WG4.1.2
27-29 April 2005	Lausanne SWITZERLAND	23 members
10-12 November 2005	Kuala Lumpur MALAYSIA	18 members
26-28 April 2006	Dubrovnik CROATIA	26 members
8-12 August 2006	Quebec CANADA	20 members
October 2006	Copenhagen DENMARK	WG4.1.1
13-14 June 2007	Tokyo JAPAN	20 members

## 2. PRODUCTIONS

### 2.1. Publications

The following publications are at the time of the finalization of actual report:

- “Asset Management Practice” under the management of Tim Gilchrist (USA) until February 2007 and Bjorn Skoglund (Norway) and Bob Peters (Australia).
- “Integration of performances indicators” under the management of Peter de Baker (Belgium) and Thomas Linder (Germany).
- “Coordination between networks of different hierarchy levels taking into account expectations of users and residents” under the management of Christine Leroy (France).

### 2.2. Seminars

Two seminars were scheduled in April 2004 and May 2007. They were cancelled by abandonment of the hosting countries to organize them.

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## **STRATEGIC THEME 4**

### **TECHNICAL COMMITTEE ROAD/VEHICLE INTERACTION (4.2)**

#### **2004-2007 ACTIVITY REPORT**

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Leif Sjögren, Sweden  
Brian Ferne, United Kingdom  
Frank B. Holt, United States  
Gerardo Flintsch, United States

## 1. COMMITTEE MEETINGS 2004 - 2007

Paris (France)	4 - 5 May 2004
Toronto (Canada)	10 - 11 June 2004
Washington D.C (USA)	6 - 7 January 2005
Rome (Italy)	6 - 7 October 2005
Bamako (Mali)	23 - 24 February 2006
Quebec (Canada-Quebec)	9 - 10 August 2006
Madrid (Spain)	19 - 20 March 2007
Paris (France)	17 September 2007

Several of the meetings were held jointly with other events. These are:

- June 2004 meeting in Toronto and SURF 2004 organised by TC 4.2 including a DC/CIT Workshop
- January 2005 meeting in Washington DC and TRB Annual Meeting
- February 2006 meeting in Bamako and TC 4.2 International Seminar for DC/CIT countries
- August 2006 meeting in Quebec with the ST4 meeting and Seminar on Asset Management
- September 2007 meeting in Paris and World Road Congress

## 2. TERMS OF REFERENCES, WORK PROGRAMME AND ORGANISATION

### 2.1. Terms of reference

- 4.2.1 - Having a 20 to 30-year vision of developments in vehicle and road pavement characteristics
- 4.2.2 - Reducing road noise
- 4.2.3 - Improving the description of pavement surface characteristics

### 2.2. Work programme and organisation

The work programme for TC 4.2 between 2004 and 2007 adheres closely to the Terms of Reference approved by the PIARC Executive Committee and the work items proposed by the TC 4.2 members in order to fulfil the Terms of Reference specified for TC 4.2. In order to meet the terms of reference, five working groups were established in TC 4.2. Special attention was paid to the international seminar concerning vehicle/road interaction and surface characteristics with focus on developing countries (DC) and countries in transition (CIT) and to the preparation of the Sixth International Symposium on surface characteristics to be organised by TC 4.2 and held in 2008.

For those purposes several working groups were established.

#### 2.2.1 *Working group A*

Trends in vehicle-road interaction monitoring for design and management

Leader: F. La Torre, Italy

Selected strategies:

- Setting up an inventory of the available and potential monitoring techniques for collecting dynamic loading, speed, stress in motion and vehicle counts data
- Preparing a state of the art on the current and future use of data that is collected and monitored for pavement design and management purposes. The aim is to identify if and how the evolution in the traffic characteristics (traffic volumes and mixes, speed, loading) can be tackled in pavement design and management

#### 2.2.2 *Working group B*

Road Traffic Noise Emission

Leader: M. Haider, Austria

Selected strategies:

- Review the recent developments and future prospects in vehicle, tyres and pavements influencing road traffic noise emission. Establishing a state of the art of traffic noise reduction technologies at the source, identifying research needs, as well as identifying and recommending new and promising global noise reduction strategies
- Review the current noise measurement methods, recommendation on strategies for their harmonisation (if necessary) and support integration of methods to achieve a standardised set of tools to characterize the noise performance of road surfaces.

### 2.2.3 Working group C

Continued Work on Texture, Skid Resistance and Evenness

Leader: R. Sinhal, United Kingdom

Selected strategies:

- Secure the availability, reproducibility, and proper use of the PIARC reference tire for skid resistance testing.
- Establish rules for managing skid resistance: equipment comparisons, calibration methods, interpretation, and use of results.
- Establish rules for longitudinal and transverse evenness measurement and assessment.

### 2.2.4 Working group D

Automatic cracks measurement and unpaved road distresses survey equipment.

Leader: M. Boulet, France

Selected strategies:

- Inventory of the methods to detect, to identify and to precisely (geometrically) describe roads cracks (and other surface defects: potholes, ravelling, bleeding,...) with the aim to increase the reproducibility of their measurements.
- Setting up a method or procedure to assess and to classify the crack automated (and semi-automated) measuring devices with respect to their reliability (bias and repeatability)
- Inventory of the methods to characterize and to record surface distresses on unpaved roads, and of the appropriate survey equipment

### 2.2.5 Working group E

Advanced Road Works Acceptance Methods and Criteria

Leader: J. Emery, Canada (Co-leaders: J. Lang, Sweden; and M. Swanlund, United States

Selected strategies:

- Review current practices and future trends in terms of surface condition measurements (high and low-tech) for the acceptance of road works.
- Present synthesis of performance-based surface condition measurements for parameters (properties) typically used for acceptance of road work, both short term (as constructed or rehabilitated) and longer term (warranty, performance based contracts, and asset management, for instance), including methodology and reporting.
- Develop interpretation and user guidelines for the acceptance parameters

### 2.2.6 Working group F

Organising the seminar for DC and CIT countries in Mali.

Preparation of the sixth International symposium on surface characteristics in Slovenia in 2008.

Leader Seminar in Mali: G. Descornet, Belgium and A. Cisse, Mali

Leader Symposium in Slovenia: M. Grondin, Canada Quebec and B. Leben, Slovenia

### 3. COMMITTEE PRODUCTIONS

International symposium on surface characteristics 2004 in Toronto:

The previous PIARC committee on surface characteristics C1, prepared the Fifth International Symposium SURF 2004. The symposium was held from June 6<sup>th</sup> to 11<sup>th</sup>, 2004 in Toronto, Canada, with 196 participants representing 32 countries. 93 papers and presentations were given representing the activities of 181 authors with 102 preprint papers from 24 countries. These presentations were given in Technical Workshops covering aspects such as surfacing, tyre/pavement response, achieving evenness, porous asphalts, airport pavements and making the best use of PIARC second international experiment EVEN. Technical Workshops were held covering subjects as evenness, texture/tyre wear, friction measurements, rolling noise, road technology, distress measurements and pavement management. A preprint CD was prepared with over 1000 distributed that is still available from jemery@jegel.com

A special workshop for developing countries and countries in transition was held during ng SURF 2004 concerning appropriate surfacing technology for developing countries (requirements, materials, methods, monitoring, and maintenance) through presentations contrasting developed and developing countries with focus on quality pavements for quality life. The participants had the opportunity during a round table discussion to highlight and get feed back on, specific issues within their country or region. Following the round table discussion each group gave a report on the issues dealt with during the plenary session of the Workshop.

International seminar Bamako, Mali, February 21 – 24 2006:  
Monitoring and Managing Paved and Unpaved Roads

This International Seminar was organized by the PIARC Technical Committee C4.2, Road / Vehicle Interaction, and the PIARC National Committee of Mali. More than 100 pavement experts from many African and European countries attended the event, along with experts from North America and Asia.

Malian Transport Minister Abdoulaye Koïta welcomed participants upon their arrival, and expressed his great pleasure in hosting such a large number of experts from around the world, stating that discussions among the delegates provided a unique opportunity to add tangible value to road network management. PIARC Secretary General Jean-François Corté then gave a presentation on the World Road Association, and the Chairman of the Committee 4.2, Bjarne Schmidt, discussed the main areas of the Committee's work. Finally, Gabouné Keita, the National Director of Malian Roads, led off the seminar with a description of Mali and its road network.

The seminar was divided into four sections: paved roads, unpaved roads, a discussion workshop, and a technical tour. Details of the presentations can be found at the PIARC website: <http://www.piarc.org>

Discussion workshop

An important and highly appreciated part of the seminar was the workshop part where the participants were split up into four groups providing the possibility to discuss the many

topics introduced by the organizers and by the different presentations. Following that, a plenary session gave participants a chance to share their ideas.

The many technical issues that were discussed included methods of using dust suppressors, the forms of deterioration that must be taken into consideration, safety factors associated with surface characteristics, and the warranty requirements that must be included in repair specifications.

It was revealed that there are a wide variety of ways to suppress dust, including coating the surface (treatment or overlay), spraying with calcium-based products, adjusting the grading, and planting protective hedges at strategic locations along roads. Another way is simply to reduce the speed limit in the most sensitive stretches near residential areas.

With respect to improving user safety, participants often cited the need to install more signs at hazardous locations, because deterioration occurs quickly in the event of heavy downpours, and repair work is sometimes very slow in coming.

Other discussions focused on the useful life of unpaved roads. Participants generally agreed that the lifespan of an unpaved road ranges from 5 to 7 years, depending on the structure of the roadbed. In wetter areas, the lifespan can be as short as 4 years, or even 3 years. In all instances, regular maintenance, mainly consisting of annual re-profiling, was recommended.

In some regions, aside from the problems associated with the amount of water, sand is often responsible for poor skid resistance, and sometimes becomes a barrier for vehicles. Planting hedges along the road is an effective means of dealing with this problem.

In many cases, limited financial means makes those involved in these issues to look for inexpensive survey and repair techniques, and to use them only in the most critical locations.



Figure 1 - International seminar on Monitoring and Managing Paved and Unpaved Roads in Bamako.

*Round table Road asset management, Quebec Canada, 11 of August 2007*

## Road surface monitoring and asset management :

The global increase in traffic, traffic speed, and loads has implications for road managers and decision makers. The allocated financial resources therefore demands for carefully planned and optimised maintenance and rehabilitation methods to maintain, in a sustainable way, an acceptable level of safety, riding comfort and traffic noise. The growing interest in public, private partnership in managing road networks which incorporates new types of contracts and functional specifications further emphasis the need of good quality data describing the condition of pavement surfaces and the interaction between the road and the vehicle as experienced by the road user.

To perform an optimal and reliable Asset management suitable and robust data for evaluating pavement surface characteristics as safety, riding comfort and traffic noise etc. are necessary and vital. Also it is important to secure the usability of road surface characteristic data for modelling road/vehicle interaction in performance indicators in relation to user expectations, and to include evaluation or procedures for establishing solid prediction models for proposed performance models. The usability of asset management for long term optimisation of road networks requires prediction of the changes in performance of the road network due to traffic and climatic induced influences.

The condition of the infrastructure can be quantified in many aspects depending on the issue in focus. The development of techniques for measuring pavement surface characteristics continues to advance. Work, led by PIARC has in the recent years been devoted to comparing existing systems for the measurement of friction, texture, and longitudinal and transverse unevenness of pavements.

The growing trend in the use of end product and functional performance type specifications, in the construction and management of roads, has made the provision of accurate and consistent road monitoring systems essential.

## Road user expectations:

The expectation of the road user is a fundamental issue when constructing and maintaining road networks and should be a vital parameter in Asset management. The challenged for the road administration community is if those methods in use to quantify the quality of the roads in a sufficient manner correspond to the levels of expectations required or demand by the road user. Are the measurements and the pavement performance indicators that are used to day, and which in most cases are different from country to country, sufficient tools to quantify present serviceability levels? Road users to day have an expectation that the road network is passable, safe and comfortable to use. In order for a road administration to ensure this for the road users, measurement and monitoring of the condition of the road network are important. However do the models in use quantifying the condition of the road surface characteristics meet the user expectation or the road user experience? Well known indices for quantifying road unevenness have been in use for many years and are widely used around the world. However, research has shown that these are often related to certain vehicle types as passenger cars and does not reflect the experience by for example truck operators which are exposed to vibrations etc. 8 hours a day. The technology enhancements through out the last decades, going from mechanical analogue equipments to sophisticated digitised equipments have optimised the possibilities of performing measurements on in-service roads without reducing or obstructing the traffic.

International Workshop on Automated detection of pavement cracking,  
Laval University, Québec Canada August 13.

The workshop was attended by 44 participants representing 22 countries.

The main objective was to give experts, researchers, suppliers and users access to the latest information and an opportunity to exchange knowledge and experience pertaining to the development and evaluation of automated or semi-automated crack detection systems. The secondary objective was to allow PIARC/TC4.2 identify needs and to determine the means of increasing R&D efforts and improving harmonization procedures.

The program included 13 presentations covering the topic areas discussed below.

- Methods for detecting and quantifying cracks and other distresses from a standards perspective.

Two presentations on distress standards were made, one from France (LCPC) and one from the United States (AASHTO) perspective. The AASHTO protocols are somewhat similar to the work being done by WGD in that the lane is divided into zones.

- Current developments in processing and analysis technologies – from the designer's and researcher's perspective

Roadware presented some history on the evolution of imaging systems from analog / tape to current state of the art linescan pavement imaging as well as how cracking is evaluated by their customers. Each customer has their own set of control sites that they have visually rated as their "ground truth" with which to rate the system performance against and each agency has their own rating scheme.

The definition of a crack was discussed and it was clear that there is no single universal definition that is accepted. The presenter asked an interesting question; "When is a crack, not a crack?" and proposed a response – "When someone else is looking at it.". The message was that every agency has their own definition and rules when it comes to cracking.

INO presented some new technology for road imaging and cracking detection. The system is based on 3D imaging of the road surface using lasers. The images shown were very good and presented some interesting ideas for crack detection. This suggested that depth could become part of the definition of a crack and possibly be used to minimize false crack detection.

TRL presented the system HARRIS. The system is based on line scan cameras which produce high resolution images of the pavement. Recent developments allow having access to the profile information, color and black and white images which increase the accuracy and the consistency of the survey.

- Evaluation and qualification procedures for measuring systems

There were five presentations discussing various experiences from Britain, Sweden, Japan, Australia and The Netherlands. It was interesting to note that the experiences,

although similar in nature each had their own issues and areas of concern that were important.

A presentation by WGD on their (work in progress) proposed distress evaluation methodology was presented. The methodology proposed a three phased approach to a standard evaluation of systems. The first phase was a system calibration and controlled test with artificial cracking to evaluate resolution and basic performance. The second phase was “project level” evaluation where the system is tested on relatively small sections of road with a known number of varied cracks. The third and final phase was a “network level” evaluation based on many kilometers of road and assessing the general performance for levels of acceptability.

Each test phase would have a performance classification scale that a system could be considered to be compliant to.

Discussions at the end of the presentations covered various thoughts on the specific agency’s evaluation methods and the WGD protocol. There was some concern that the protocol method might be too cumbersome and that certain modifications might need to be made. The participants agreed to comments the draft technical report of the WGD that will be provide in 2007.

Sixth International symposium on pavement surface characteristics in Slovenia October 21 – 23, 2008

The committee has initiated the organisation of the Sixth International Symposium on Road and Airfield Surface Characteristic. For that purpose a scientific committee, led by Mathieu Grondin for Canada-Quebec and an organising committee led by Bojan Leben, Slovenia has been established. The first call was published in the beginning of 2007 ([www.surf2008.si](http://www.surf2008.si)).

The main objective of the Symposium is to share and discuss experience about how to improve quality through effective management of road infrastructure assets, in accordance with user expectations and managers’ requests. Technical sessions will include:

- Exchange of technology ideas and visions on road and airport pavement surface characteristics.
- Efficient management of road assets with management systems capable of integrating all infrastructure components, based on performance indicators describing road functionality,
- The condition of surface characteristics-including bridges and geotechnical structures (longitudinal and transverse profiles, distress detection, noise, skid resistance measures, analysis, and interpretations etc...),
- Presentation of the results of the work of PIARC TC 4.2 and of cooperation with international institutions, the automotive industry, and organisations dealing with the construction and maintenance of road infrastructures.



Figure 2 – Ljubljana, the venue of SURF2008

23<sup>rd</sup> World road congress, Paris, 17 – 21 September, 2007.

Two congress events to be held by TC 4.2 have been organised namely the committee session and a workshop on the Impact of Emerging Vehicle, Pavement and Monitoring Technologies on Road Vehicle Interaction: “Where will we be in 30 years?”

The detailed programmes are given in the introductory report for these two sessions. The objectives and principle topics are as follows:

The main session of TC 4.2 (September 18)

1. Committee activity report 2004 – 2007, by Bjarne Schmidt
2. A 20 to 30 years vision by Francesca La Torre
3. Road traffic noise emission – Measurement methods by Manfred Haider
4. Reference tyres for skid resistance testing by Michel Gothié
5. Guidance on managing skid resistance and pavement evenness by Ramesh Sinhal and Brian Ferne
6. Performance evaluation of automated pavement cracking detection equipment by Michel Boulet
7. Methods and equipment for inspecting unpaved roads by Yves Provencher
8. Performance Indicators for Asset Management by John Emery

The workshop organised by working group A and chaired by Francesca La Torre, will deal with the issues of “having a 20 to 30-year vision of developments in vehicle and road pavement characteristics” as one of the key issues for TC 4.2 to address in the 2004-2007 term.

This issue will be tackled by focusing on two aspects:

- how are vehicles changing with respect to their influence on pavement design and management and where they will be in 20 to 30 years;
- how can pavement managers keep track of these changes and consider them in pavement design and maintenance activities.

The workshop participants will be the actors from vehicles, trucks and tyre manufactures, road managers, pavement designers and researchers, and the objectives is for them to share their views and find a common understanding of the impact of these evolutions on road/vehicle interaction.

The key topics that will be addressed at the workshop are:

- How can the understanding of emerging technologies in vehicles, tyres and roads be improved?
- What impact will this have for the roads over the next 30 years?
- Can future vehicle design rules be less prescriptive and more performance based?
- Can we make cars, trucks, tyres, and roads safer with new technology?
- Can road managers take advantage of vehicle technology in designing new roads?

The main outcome of the Workshop is the identification of the trend in emerging technologies and their possible impact on pavement, vehicle, and tyre design.

During the Workshop the result of the survey on monitoring techniques performed by TC 4.2 Committee to address the issue of keeping track of vehicle changes will be presented.

PIARC Test tyres user group:

In order to secure the production and further development of the PIARC test tyre, TC 4.2 has established a User Group. The group has met 6 times.

1<sup>st</sup> meeting in Paris, October 14, 2004

2<sup>nd</sup> meeting in Vienna, May 11, 2005

3<sup>rd</sup> meeting in Rome, October 5, 2005

4<sup>th</sup> meeting in Prague, May 10, 2006

5<sup>th</sup> meeting in Zurich, November 8, 2006

6<sup>th</sup> meeting in Helsinki, May 30, 2007

This working group participated to the writing of two technical specifications edited in 2004 by PIARC and put at disposal on its Internet site. These two specifications: "Specifications of a standard test tyre for a road friction coefficient measurement: the smooth tyre " and "Specifications of a standard test tyre for road friction coefficient measurement: the grooved tyre", can be downloaded on the PIARC website <http://www.piarc.org/en/publications/tech-report/>.

The working group also wrote two articles for the Route/Roads magazine. One article described the use of the PIARC test tyres (running in, storage, use limits...) the other article is dealing with the PIARC test tyre seen in relation to the friction obtained by commercial tyres.

Manufacturing of the PIARC test tyres was handed over to Specialty Tires in United States which succeed the company VREDESTEIN. The first production of 40 tyres was made in spring 2007; the countries which bought these tyres are testing them in the 2007.

It is important to note that the main aim of this user group concerning the production of the PIARC test tyres is important and shall continue as long as there are customers for the PIARC test tyre for friction. This work should then be carried out in the PIARC context no matter what a new structure or terms of reference should occur for the coming committee structure.

#### 4. PUBLICATIONS

WG	Year	Title	Publication	Author
TC	2004	5 <sup>th</sup> Symposium on Pavement Surface Characteristics	Surf 2004 Preprint CD	SURF 2004 Committee
A	2007	Inventory of monitoring techniques for loading, speed, stress in motion, vehicle counts	PIARC Technical report	Members of TC 4.2 WG A
B	2007	Road Traffic noise emission, Recent developments and future prospects	SIIV, Palermo 12-14/09/2007	Members of TC 4.2 WGB
C	2004	The Hermes project - A new Reference Devise	SURF 2004	M. Gothié
C	2004	Specification for a standard test tyre for friction coefficient measurement of a pavement surface: smooth test tyres	<a href="http://www.piarc.org/fr/publications/rapports/">www.piarc.org/fr/publications/rapports/</a>	M. Gothié
C	2004	Specification for a standard test tyre for friction coefficient measurement of a pavement surface: Ribbed test tyres	<a href="http://www.piarc.org/fr/publications/rapports/">www.piarc.org/fr/publications/rapports/</a>	M. Gothié
C	2006	Use of PIARC test tyres for the characterization of skid resistance	Route/Roads 330	M. Gothié
C	2007	PIARC test tyres representativity	Route/Roads 334	M. Gothié
C	2007	PIARC test tyres	Paper for WRC	M. Gothié
C	2005	Review of UK skid resistance Policy	Route/Roads 326	H. Viner R. Sinhal and T. Perry
C	2007	Guidance on managing skid resistance and evenness	Paper for WRC	Members of TC 4.2 WG C
C	2008	Guidance on managing skid resistance and evenness	Route/Roads January issue	Members of TC 4.2 WG C
D	2007	Evaluating the performance of Automated Pavement Cracking Equipments	Technical Report	Members of TC 4.2 WG D
D	2007	Survey of methods of monitoring unpaved roads	Route/Roads	Yves Provencher
E	2007	Performance Indicators for Asset Management	Paper for Paris, 2007	J. Emery
E	2007	Performance-based Surface Condition Indicators for acceptance of Roads Works and Transportation Asset Management Activities	Technical Report	Members of TC 4.2 WGE

## **STRATEGIC THEME 4**

### **TECHNICAL COMMITTEE ON ROAD PAVEMENTS (C4.3)**

#### **2004-2007 ACTIVITY REPORT**

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## 1. INTRODUCTION

The Committee on Road Pavements C4.3 was created for the PIARC Congress held in Rome in 1962. Originally named "Technical Committee on Pavement Design", it subsequently split in 1965 into C7 Concrete Roads and C8 Flexible Roads. The activities of the Technical Committee on Testing of Road Materials, C2, which was created in Munich in 1934, were transferred to C7 and C8 in 1992. Those two Committees merged into one single Technical Committee C7/8, Road Pavements in 2000. In 2003 the committee was renumbered C4.3 to align with PIARC Strategic Theme 4.

C4.3 Committee on Road Pavements has 56 members, 12 corresponding members, 10 advisors, and 3 industry representatives.

## 2. WORK PROGRAM AND ORGANISATION

Based on the direction given in PIARC Strategic Theme 4: Quality of Road Infrastructure, C4.3 developed the following topics for study during 2004 - 2007:

- Issue 4.3.1 - Selecting adequate pavement types and road techniques;
- Issue 4.3.2 - Maintaining pavements; and
- Issue 4.3.3 - Minimising the impact of road works on the road users and adjacent land use.

A sub-group was formed to deal with each issue.

The work of the committee was progressed at eight meetings, some of which were conducted in conjunction with other activities as follows:

- Paris, France, 4 -5 May 2004
- Lisbon, Portugal, 7 – 8 October 2004
- Liverpool, United Kingdom, 22 – 23 February 2005
- Krakow, Poland, 19 - 20 September 2005
- Vienna, Austria, 2 -3 March 2006
- Quebec City, Canada, 9 -10 August 2006
- Berlin, Germany, 16 – 17 November 2006, and
- Havana, Cuba, 17 April 2007.

In addition to preparing PIARC reports on each of the topic areas, the Committee has been involved in organising and presenting two seminars. The first, conducted in Krakow, Poland and supported by the Road and Bridge Research Institute (IBDiM), aimed at raising awareness of the special challenges of Urban Pavements. The other, held in Havana, Cuba and supported by the Cuban Ministries of Transport and Construction, addressed pavement maintenance and rehabilitation.

At the Paris Congress, to be held in September 2007, the committee will present the sub-group reports and hopes to stimulate discussion on ways to foster:

- implementation of innovations in the design, construction and maintenance of long-life and urban pavements
- promotion of pavement recycling, and
- mitigation of the impacts of pavement construction.

The activities of the sub-groups form the remainder of this report.

### **3. SUB-GROUP 4.3.1 – LONG LIFE AND URBAN PAVEMENTS**

#### **3.1. Contributing Committee Members**

Jean-Michel Piau, France and Andre-Gilles Dumont, Switzerland, sub-group leaders

Nagato Abe, Japan

Peter Andersen, Denmark

Bin Hassan Azmi, Malaysia

Egbert Beuving, EAPA

Christian Caestecker, Belgium

Jean-Pierre Christory, France

Dominique Irastorza-Barbet, France

Carlos Jofre, Spain

Helena Lima, Portugal

Ousmane Nacoulma, Burkina Faso

Louis Ngagnon, Congo

Nelson Rioux, Canada-Quebec

Safwat Said, Sweden

Tim Smith, Canada

Johannes Steigenberger, Austria

Darius Sybilski, Poland

Jan Van der Zwan, Netherlands

Suneel Vanikar, United States of America

Benoit Verhaeghe, South Africa

Andre Jasienski, Belgium

Jose Ortiz-Garcia, United Kingdom

Yasumasa Torii, Japan

Asghar Naderi, Iran

### 3.2. Sub-group 4.3.1 Work Program

The goals of Sub-group SG4.3.1 were to:

- review material types and construction techniques suitable for long-life pavements; and
- review specific needs, existing practices and innovative techniques for design, construction and maintenance of urban pavements.

#### 3.2.1 *Long-Life Pavements*

In order to reduce traffic interruptions from pavement maintenance activities, many organisations are looking to build pavements that will last for a longer period. Achieving longer-lasting pavements can be done in different ways, such as:

- Improving design and construction techniques to build better and longer-lasting pavements,
- investigating pavement materials and products that could be used to build more durable pavements.

SG4.3.1 sought to complement the work being done by the Organisation for Economic Co-operation and Development (OECD) on the economic evaluation of long life pavement materials by undertaking to document examples of successful long-life pavements from around the world. SG4.3.1 developed a definition of Long Life Pavements, LLP, and invited committee members and other organisations to submit papers with examples of pavements that lasted longer than expected and fitted their LLP definition. Based on these papers, guidelines for the design of long- life cycle pavements have been developed.

The goal of analysing the success stories was to understand the reason why particular pavements had lasted for a particularly long period. These lessons could be used to inform the design, construction and maintenance of future pavements. The intention of the sub-group was to show that Long Life Pavements are affordable over their life-cycle.

These "success stories" are included in the appendix to the resulting report highlighted the types and techniques suitable for long-life pavements.

The principal findings of SG4.3.1 on Long Life Pavements are:

- There are numerous examples around the world of flexible, semi-rigid and rigid pavements that qualify as long life pavements.
- There are a number of factors that have led to this high standard of performance including:
  - high quality of the materials and construction
  - improved sub-grade, drainage, quality of design and detailing
  - quality of the regular preventative maintenance.

#### 3.2.2 *Seminar on Urban Pavements*

The world's population is becoming increasingly urban, with over 85% of the population of many industrialised countries living in cities. Urban roadways make up a large part of the public space in such cities. These spaces, as well as carrying public and private vehicle and pedestrian traffic on the surface, are crowded with a growing list of services below ground level. City dwellers, as well as expecting this open space to be functional, increasingly require it to aesthetically enhance their lifestyle.

Managing these competing needs and the large number of stakeholders in the use, development and maintenance of urban pavements, is becoming a complex task.

SG4.3.1 approached these issues by tasking a small group to organise a workshop on the topic in order to stimulate discussion between representatives of the range of disciplines involved. This workshop was intended to exchange experiences and highlight the issues peculiar to urban pavements.

Jean-Pierre Christory, Nelson Rioux, Jean-Michel Piau and Darius Sybilski, together with the sub-group and the Polish Road and Bridge Research Institute (IBDiM), organised a two-day urban pavements seminar in Krakow, Poland in September 2005. It was sponsored by the Municipality of Krakow and the Secretary of State at the Polish Infrastructure Ministry. 200 participants participated in presentations and discussion on:

- Who is involved in urban infrastructure and the co-ordination of their resources
- The specific characteristics of urban roads and issues these create
- Design of urban roads together with public areas
- Techniques for and innovations in the construction of urban pavements
- Contributions to sustainable development
- Road works sites and operations on urban networks.

The seminar's conclusions were:

- Urban streets are more than just roadways.
- The complexity of urban design demands that engineers work together with architects and planners to deliver an integrated pavement design that takes into account the aesthetics, as well as the functionality and durability of paving materials.
- The high costs associated with urban pavements are driving a high level of innovation and the multiple use of the pavements, including water storage and filtering systems, heat sinks, or air pollution adsorbing mediums.
- Composite pavements are becoming increasingly used to cope with the variety of transport modes and underground services employed in cities.
- Recycling of urban pavements increasingly contributes to sustainable development in an environment where removal and dumping waste is often difficult.
- Ongoing communication and exchange of experiences between those involved in urban infrastructure around the world should continue to be encouraged by international bodies such as PIARC.

### 3.3. Sub-Group 4.3.1 Outputs

The outputs of SG 4.3.1 included:

- an international seminar on Urban Pavements in Krakow, Poland in 2005
- a CD of the Urban Pavements Seminar proceedings, along with a report to PIARC and an article in *Routes/Roads*
- a PIARC report on Long-Life Pavements, highlighting success stories and lessons learned, and
- a summary of the work of the sub-group to be presented at C4.3 session at the Paris PIARC Congress in September 2007.

## 4. SUB-GROUP 4.3.2 – MAINTAINING PAVEMENTS

### 4.1. Contributing Committee Members

Sally Ellis, United Kingdom, sub-group leader

Allan Bell, Australia

Brian Perrie, South Africa

Benoit Verhaeghe, South Africa

Ian Carswell, United Kingdom

Maria de Lurdes Antunes, Portugal

Ralf Alte-Teigeler, Germany

Randolf Anger, Germany

Herald Piber, Austria

Branimir Palkovic, Croatia

Eleonora Cessolini, Italy

Zigmantas Perveneckas, Lithuania

Andrus Aavik, Estonia

Hrvoje Rukavina, Croatia

Vaclav Neuvirt, Czech Republic

Agnes Gorgneyi, Hungary

Andreas Loizos, Greece

Wlodzimierz Supernak, Poland

### 4.2. Sub-group 4.3.2 Work Program

SG4.3.2's overall objective was to promote pavement recycling. It also undertook to establish the need for guidelines on pavement maintenance in developing countries, with a view to recommending to the next Committee on Road Pavements if further work was required.

#### 4.2.1 *Pavement Recycling*

A questionnaire was distributed to ascertain the status of pavement recycling in committee member countries. There was a wide variety of responses, reflecting the amount of recycling being undertaken.

The sub-group has produced a PIARC report titled "Review of the Growth and Development of Recycling in Pavement Construction" for presentation at the World Road Congress in Paris in 2007.

Two papers on pavement recycling submitted by the sub-group were published in *Routes/Roads*. Other papers compiled by the sub-group will be included in the sub-group report as examples of successful pavement recycling activities.

It is believed there are many factors inhibiting the use of recycled and alternative material in pavement construction. Most of these are non-technical and include:

- Client education/lack of awareness – general lack of awareness of the possibilities and successful applications of new materials and methods; perceived problems with new methods or materials, either from first-hand experience or relayed by the press or colleagues.
- Specifications and standards – lack of suitable specifications for the new methods and new materials.
- Test methods – lack of suitable test methods for alternative materials.
- Reliability and quality control – concerns over the reliability and quality control of new methods and alternative materials.
- Waste regulation – the complexity of the waste management and licensing system, and the potentially long timeframe required to obtain licences and exemptions.
- Environmental concerns – concerns about environmental pollution through leachate or dust generation.
- Conditions of contract – conditions of contract which do not encourage innovation or flexibility.
- Planning – difficulty getting planning permission for recycling centres in or near urban areas.
- Supply and demand – the difficulty of balancing supply and demand for alternative materials.
- Economics – the perception that new methods and materials will be more expensive than traditional ones.

#### 4.2.2 *Survey on Pavement Maintenance Guide*

A survey on the need for pavement maintenance guidelines was undertaken in developing countries in 2006. There was a limited response to this survey and it has been concluded that:

- there was not an urgent need for a PIARC Pavement Maintenance Guide among developing countries represented on C4.3;
- there was some interest in guidelines on hot-in-place recycling of asphalt and culvert and drainage maintenance; and
- the PIARC publication "*Save Your Countries Roads*" should be useful in developing countries to highlight the need for road maintenance.

#### 4.2.3 *Seminar on Maintaining Pavements*

The objectives of the international seminar on Road Pavement Maintenance conducted in Havana, Cuba on 18, 19 and 20 April 2007 were to:

- provide developing countries with the opportunity to make their needs better known to PIARC
- enable C4.3 to share its knowledge and expertise
- encourage both C4.3 and the developing countries to initiate or improve co-operation.

The topics covered in the seminar included:

- Pavement evaluation
- Pavement maintenance techniques
- Pavement recycling techniques
- Maintenance treatment selection, and
- Identification of pavement knowledge needs of Latin American countries.

#### 4.3. Sub-group 4.3.2 Outputs

Sub-group 4.3.2 outputs included:

- A PIARC report for the World Road Congress in Paris 2007
- Two papers on pavement recycling published in Routes/Roads
- A recommendation on future committee work on pavement maintenance guidelines for developing countries
- Presentation of the results of the sub-group activities at the World Road Congress.

The C4.3 Committee, together with Cuban Ministries of Transport and Construction, conducted a two and a half day pavement maintenance and rehabilitation workshop and site visit.

### **5. SUB-GROUP 4.3.3 – THE IMPACTS OF ROAD WORKS**

#### 5.1. Contributing Committee Members

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Tim Smith, Canada

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Allan Bell, Australia

Sally Ellis, United Kingdom

## 5.2. Sub-group 4.3.3 Work Program

Sub-group 4.3.3 was tasked with synthesizing information on techniques to reduce the impact of pavement construction, rehabilitation and maintenance activities on road users (driving public and construction workers) and on adjacent land use (homeowners, businesses, etc.). In 2005, a preliminary survey was sent to the representative members of PIARC committee TC 4.3 about the importance and availability of information on noise, safety, environmental pollution, availability and nuisance due to road work.

### 5.2.1 *Survey on the Impact of Road Works*

Specifically, the survey asked for documentation on regulations, guidelines, best practices and codes of practices. Agencies were asked to:

- describe their regulations and guidelines, noting whether they were prescriptive (method based), end result based or performance based;
- indicate what they did to measure compliance with the requirements.
- describe the development of their current approach, whether it differed from what had been done in the past and in what way.

A key aspect of the survey related to innovation to mitigate the impact of road work: how innovations have been implemented, who was responsible for innovation, e.g. agency or contractor, and what future innovations are anticipated.

In order to gain a better understanding on how individual agencies or contractors address the impact of pavement construction, rehabilitation and maintenance on road users, agencies were asked to provide examples on how they would address situations similar to an urban and a rural case study described in the survey. They were asked to describe the actions they would take to minimize any harmful effects/inconveniences, and whether this action was mandatory (by law or regulations) or just considered “good practice” in the following areas:

- Noise
- Safety (road user, construction worker)
- Environmental pollution (air, water, soil)
- Roadway availability
- Vibration
- Nuisance

### 5.2.2 *Survey Findings*

The survey found that safety of both road users and construction workers was of the highest priority in all phases of road design and construction. Lighting, odours and aesthetics were less important. A summary of the key findings follows:

- Noise - Most agencies have specific regulations and guidelines to limit noise during roadway construction activities. Guidelines and regulations range from the use of a maximum noise limit for all road activities to complex matrices providing maximum noise levels by roadway/highway functional class and day versus night conditions.
- Driver Safety - Driver safety during roadway construction is typically governed by guidelines for traffic and work zone safety.
- Worker Safety - Worker safety for most jurisdictions is governed by law. Many agencies have specific documentation and guidelines to protect workers during construction.

- Air Pollution - Most road authorities include environmental protection clauses and regulations in their specifications or specific laws that address air pollution. Most require a contractor to produce an Environmental Management Plan for a construction job.
- Water Pollution - Most agencies have very strict laws, rules and guidelines with regard to water pollution and runoff from construction worksites.
- Soil Pollution - Most agencies have very strict laws, rules and guidelines with regard to soil pollution. Many agencies are turning to recycling activities to help eliminate the need to disturb the soil during pavement rehabilitation projects.
- Roadway Availability - There are many design and construction procedures that can improve roadway availability and access to adjacent businesses and homes. These include communication, advanced planning, promotion of public transportation, construction innovation and contracting techniques.
- Aesthetics - The majority of agencies do not consider aesthetics in the design and construction of pavement projects.
- Lighting - Lighting is not generally considered during road work other than the need to have adequate lighting during night-time construction work. Several agencies indicated that construction lighting can be an issue for homeowners adjacent to construction work zones, but is usually only considered when a specific complaint is received.
- Odours - Agencies typically cover odours under air pollution regulations and guidelines. Most agencies indicated that odours are not considered for construction and rehabilitation projects.

The results of this study can be used by agencies to assist in determining the impact of road construction and maintenance activities on road users (driving public and construction workers) and the surrounding land use. Information collected as a part of the study included regulations (e.g. requirements for construction work to take place during weekends or nights), environmental considerations (e.g. dust control), quality/performance (contractor incentives to complete a project earlier to reduce the impact on road users) or special treatments to ensure that local traffic is not adversely impacted by construction activities etc.

The report appendices provide technical details on some innovations that can be used to minimize the impact of road construction and maintenance activities on the road users and surrounding land use.

In addition the sub-group called for papers on innovations in minimising impacts of road work for presentation at the Congress in Paris 2007.

### 5.3. Sub-group 4.3.3 Outputs

- A PIARC Report "Impact of Road Construction and Maintenance Activities on Road Users and the Adjacent Land Use" to be presented to the World Road Congress in Paris in 2007.
- Papers on innovation in minimising impacts of road works to be presented at the Paris Congress.
- Results of the sub-group activities to be presented at the Paris Congress.

## 6. ACKNOWLEDGEMENTS

The Chairman gratefully acknowledges the contributions made to the committee's activities by:

- the secretaries: Allan Bell (Australia), Jean Crochet (Belgium) and Jose Ortiz Garcia (United Kingdom)
- the sub-group leaders: S. Ellis (United Kingdom), D. Hein (Canada), Jean- Michel Piau (France) and André Dumont (Switzerland)
- the Members, Corresponding and Associate Members of the Committee
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- the Polish Road and Bridge Research Institute for supporting the Krakow seminar; and
- the Cuban Ministries of Transport and Construction for supporting the Havana seminar.

The following members of the Technical Committee on Road Pavements (TC 4.3) contributed to the writing of this activity report:

- Nelson Rioux, Chair (Québec, Canada)
- Allan Bell, English-Speaking Secretary (Australia)
- Jean Crochet, French-Speaking Secretary (Belgium)
- Jose Ortiz-Garcia, Spanish-Speaking Secretary (United Kingdom)
- André-Gilles Dumont, Subgroup Chair – Long Life Pavements (Switzerland)
- Sally Ellis, Subgroup Chair – Pavement Recycling (United Kingdom)
- David Hein, Subgroup Chair – Impact Of Road Works (Canada)

## **STRATEGIC THEME 4**

### **TECHNICAL COMMITTEE BRIDGES AND RELATED STRUCTURES (C4.4)**

## **2004-2007 ACTIVITY REPORT**

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## 1. INTRODUCTION AND CONTENTS

### 1.1. Introduction

The purpose of this Activity Report is to present an overview of the work developed by Committee TC4.4 in the period 2004-2007.

Since the constitutive meeting of the Committee in Paris, May 2004, the Committee has had 8 meetings each organized in the home countries of different Committee members and supported by their respective institutions, except the meeting in August 2006, held in Quebec (Canada) which was organized by the Theme 4 “Quality of Road Infrastructure” coordinator and grouped all the Committees under the theme umbrella.

The date and place of the meetings were the following:

Meeting 1	May 2004	Paris (France)
Meeting 2	November 2004	Madrid (Spain)
Meeting 3	May 2005	Venice (Italy)
Meeting 4	October 2005	Thessaloniki (Greece)
Meeting 5	April 2006	Budapest (Hungary)
Meeting 6	August 2006	Quebec (Canada)
Meeting 7	February 2007	Vienna (Austria)
Meeting 8	May 2007	Nagoya (Japan)

The Committee, in accordance to PIARC recommendations, devoted efforts to organize a seminar in a developing or a transition country but this project failed for two reasons. First, the lack of active members from these countries in the Committee made it difficult to establish contacts to arrange an event. Second, even with these limitations, the Committee explored the possibility to have a seminar in different countries in South America. After several failed attempts, arrangements for a seminar were done, but at the scheduled date, the political and social situation in the country dissuaded members from traveling.

### 1.2. Contents

This Activity Report includes the list of active members in the Committee, the list of meetings arranged during the four years period, some comments about the reasons for choosing the three specific tasks developed by the Committee, a synthesis of the work and the conclusions and recommendations.

## 2. WORK PROGRAM AND TASKS

After intense discussions in the first meetings in Paris, always following the ideas scheduled in the terms of reference established by PIARC, several lines of work were initially underlined: durability in the two first steps of a bridge life (design and construction), durability during the service life and, finally, the frequently unclear matter of the prioritization procedure in a bridge management system (BMS).

The two first lines of work (task 1 and task 2) covering the durability during the complete life of a bridge (design, construction and service life), have an unquestionable interest nowadays, as a significant part of the bridge stocks in many countries have reached or will soon reach an ageing condition which had not been foreseen when designed and constructed. The work of the Committee was centered in a first recompilation of the information regarding how different countries deal with this matter in the design and construction phases. In reference to the service life period, where multiple aspects can be analysed, task 2 covered how new techniques and methods in maintenance or repairing can offer functional and economic advantages as opposed to the traditional approaches.

The third task was devoted to a quite different matter, i.e. the approach to cost effective management of bridges with a focus on the prioritization procedures. This subject, analyzing the work of the Committee in the previous period as well as the current literature technique, was considered susceptible to be studied in some specific details.

These 3 lines of activity were considered as the Committee's main contribution and each of which should produce as a final deliverable a classical PIARC report including the work and conclusions for each task.

Complementarily, in the first meeting in Paris the production of a paper for the PIARC magazine regarding historical bridges was planned, but although there was general agreement on its interest, it was difficult to be achieved because there were not enough members in the Committee directly involved in this type of structures. Therefore, the inclusion of historical bridges as the lemma for the invited papers in the TC4.4 Session in the Paris Congress would cover to some degree the initial intention of the Committee.

In the second meeting of the Committee held in Madrid the three first items were analyzed and a first draft list of contents was defined for each of them. In conclusion, the three tasks to be covered definitively by the activities of the TC4.4 were

- Task 1: Improvement of durability in the design and construction phases
- Task 2: Increase of durability and lifetime of existing bridges
- Task 3: Approaches to cost effective management of bridges

Every active member of the Committee ascribed voluntarily to one of the three tasks and contributed mainly to the development of this specific activity. In some cases members contributed also to other tasks sending to the other sub-groups relevant information from their respective countries.

### **3. TASK 1: IMPROVEMENT OF DURABILITY IN DESIGN AND CONSTRUCTION**

The intended design life of bridges is long, in some countries in excess of 100 years. Whilst the masonry structures of former times have proved to be generally durable, and coped with significant changes in traffic density and loading; the popular materials of the last century (steel and concrete) have exhibited considerable problems of durability within their expected design lives.

Feedback from inspection and maintenance experience has highlighted these durability problems in bridges, and demonstrated that they arise even when material specifications are closely followed and design and construction practice are adhered to. The disruption caused by maintenance work in dealing with these durability issues is particularly significant in situations of high traffic flows that are the norm in today's developed economies. This contributes to the very significant costs of these works.

The significance of these maintenance costs, and the general inadequacy of maintenance budgets have caused engineers to question the usual design approach of minimizing the initial cost of the infrastructure, and has encouraged an approach which seeks rather to minimize the whole life cost. This presents real difficulties in the case of bridges because of their very long design lives, with the attendant difficulties of dealing with the many variables involved in such considerations over this time period. Nevertheless bridge engineers have taken an increasing interest in the impact of durability issues as many of the emerging problems have been investigated and discussed in international forums over recent decades.

This investigation has sought to pool the experience of the members of the PIARC Committee 4.4 in respect to current design, construction and maintenance practice in identifying and responding to perceived durability problems in highway bridges. The sub group working directly on this task 1 consisted of eleven members of the committee drawn from European countries, apart from the representative from Canada.

It was decided to investigate this topic by preparing a questionnaire for circulation to PIARC members, and to distill from the responses any common themes and significant trends. It was agreed to limit the scope of the questionnaire to short/medium span bridges (say 150 m. maximum span) in steel and concrete. This represents the major part of the bridge stock, where durability problems were a major issue as previously outlined. Long span bridges were recognized to be a specialized area. The questionnaire sought the considered view of experienced practitioners rather than the results of formal research, which was unlikely to be forthcoming. The questionnaire concentrated on current practice but also sought a view on future developments in the field of durability.

The Working Group debated the issues involved and developed the questionnaire so that the respondent would generally be able to give answers from existing records, or express a considered opinion without the recourse to further time consuming work.

The questionnaire was structured as follows:

Question 1.1 to 1.45      General information on the network covered by the response. (relating to size and nature of network, definition and type of structures)

Question 1.5 to 1.61      General information on current design standards. (standards used and specific requirements for durability)

Question 2   Environmental Conditions (identification of key environmental factors which may affect durability).

Question 3A   Materials Data (Relevant to Concrete, particularly for durability)

Question 3B   Materials Data (Relevant to Structural Steelwork, particularly for durability)

Question 4   Highlighted durability problems. (rankings from given list of known problems)

Question 5   Design Practice (particularly for durability, any prescriptive requirements)

Question 6   Detailing Practice (durability issues are often matters of detailing failures)

Question 7   Envisaged Developments in the field of durability. (ongoing developments or planned developments)).

The questionnaire was distributed through the membership of the Committee 4.4 and in due course some twenty three responses were received, of which the response from Spain represented the consolidation of three individual returns. The total number of bridges reported on exceeded 160,000, many of the networks reported on being part of the national network of that specific country. The mix of the returns reflected the dominance of European representation in the committee, but responses were also received from: Australia (3), Canada (2), Japan, New Zealand, South Africa and the U.S.A. and so a broad spectrum of practice and opinion was available for collation and analysis.

The questionnaire appeared to have achieved it's aim in being straightforward and simple to complete. Some clear instances of certain questions being miss-interpreted were noted and these were rectified by follow up enquiries. All the responses received were posted on the member's area of the PIARC web site. This was particularly valued by the members of the working group, and made the results accessible to the Committee in general.

The work of comparing the various responses to specific enquiries in the questionnaire was divided between members of the working group, on the basis of individual interests and expertise. When these sections of the potential final report had been drafted, they were circulated to members of the working group for their scrutiny and were discussed at subsequent technical meetings as the work became available.

The detailed analysis of the responses is dealt with in the Technical Report of the Working Group, however some results of this synthesis are presented here. The size of the networks reported on varied considerably from 200 bridges (an Australian State) to 23,900 (French National Public Network). The definition of a bridge also varied from a minimum span of 1.8m. (Queensland Australia) to 15m. (Japan). The major portion of the bridge decks were of concrete construction, with steel decks often representing less than ten per

cent of the total. Japan reported the largest proportion of steel decks at fifty percent (note they also had the greatest threshold span for being included as a bridge structure).

In terms of environment all respondents reported freeze thaw and marine conditions to some extent. There was widespread use of de-icing salts, with an expected strong correlation with the severity of the experienced freeze thaw conditions. Some experimentation in the use of alternatives to de-icing salts was also reported.

All countries reported on the use of specific bridge design codes which generally included specific requirements with respect to durability issues and maintenance. The required design life in Standards varied from 75 to 100 years. This variation is reflected in the loadings adopted in Standards and the requirements for materials, concrete formulation and cover to reinforcement. The trend in Design Standards is to design more "site specific bridges" in terms of environmental conditions, with increasing data made available in this connection, which in turn improves durability in demanding environments.

In response to the questions on materials, Alkali Aggregate Reaction was the most commonly reported durability problem in relation to indigenous materials. Durability was initially secured in concrete structures by appropriate choice of strength of concrete and cover to reinforcement. Strength generally varied between 35 and 65 Mpa with covers in the 30 to 50 mm range, but approaching 70 mm in very severe conditions. It is noted that strength continues to be adopted as the principal criteria for indirectly achieving reduced permeability and hence durability.

Of the techniques adopted for improving durability, cement replacement was the most popular, with the protection of buried concrete with bitumen and the use of coatings or impregnation also common.

For steel structures, most respondents reported the use of medium strength steels, and though a variety of techniques for improving durability were utilized to some extent, the main dependence was on conventional paint systems.

In questioning highlighted durability problems the most highly ranked aspects were: deck joints, deck waterproofing, general quality of design, low concrete covers, general construction quality and chloride attack. To a lesser extent the quality of works supervision, materials, curing procedures, regular maintenance and poor detailing practice were seen as contributing factors. It should be noted here that that the enquiry sought a view on the most significant durability problems in the bridge stock overall. A wide range of factors can be of major significance for a specific structure, and so a low ranking here should not imply the factor is trivial in any sense.

The problems already experienced with bridges built in the last century have already influenced the approach to inspectability and easy/minimal maintenance, and this was reflected in the wide range of detailed provisions reported.

Durability issues have also significantly affected design practice, with integral and semi integral bridges emerging as the desired option for short span bridges. There is considerable variation in the reported maximum overall lengths considered appropriate for such bridges (30 to 120 m. for straight bridges, 200 m. for curved).

Other trends reported were the continuing development of High Performance Steels and High Performance Concrete with the dual advantages of increased structural efficiency and improved durability.

The data collected is considerable in extent and is considered to be a valuable resource. It covers a wide range of different contexts from large existing bridge stocks with a wide range of ages of individual bridges, to comparatively young bridge stocks on specific major new routes. There is also a wide range of environmental conditions, design standards, and construction and maintenance practices covered by the survey. Despite all these variables there are many areas of similar experiences and views, and the differences in approach when encountered often can be a catalyst to informed debate and review of current practice.

#### **4. TASK 2: INCREASE OF DURABILITY AND LIFETIME OF EXISTING BRIDGES**

Based on a questionnaire to members of PIARC technical committee TC 4.4, the scope of this study is to present an inventory or a library of examples on methods of minimizing the maintenance or repair cost and/or minimizing the traffic restrictions through increasing the durability and lifetime of existing bridges or other highway structures or structure components.

##### **4.1. Comparison of traditional and new, alternative repair/rehabilitation methods**

How to increase the durability and/or minimizing the traffic restrictions are presented by an evaluation and comparison of a traditional repair method of solving a detected problem against a new, alternative repair method of solving the same problem. Definition of the traditional method and the new method was up to the replier on the questionnaire.

The principal idea (background) of the study is presented in Figure No. 1.

The examples of solving problems are completed with recommendations for the future design or detailing of bridges or other structures on how to avoid the detected damage/problems in the future.

The study will comply with the general PIARC, ST4 strategic goal: “to improve the quality of the road infrastructure through effective management of road infrastructure assets in accordance with the user expectations and manager’ request.”

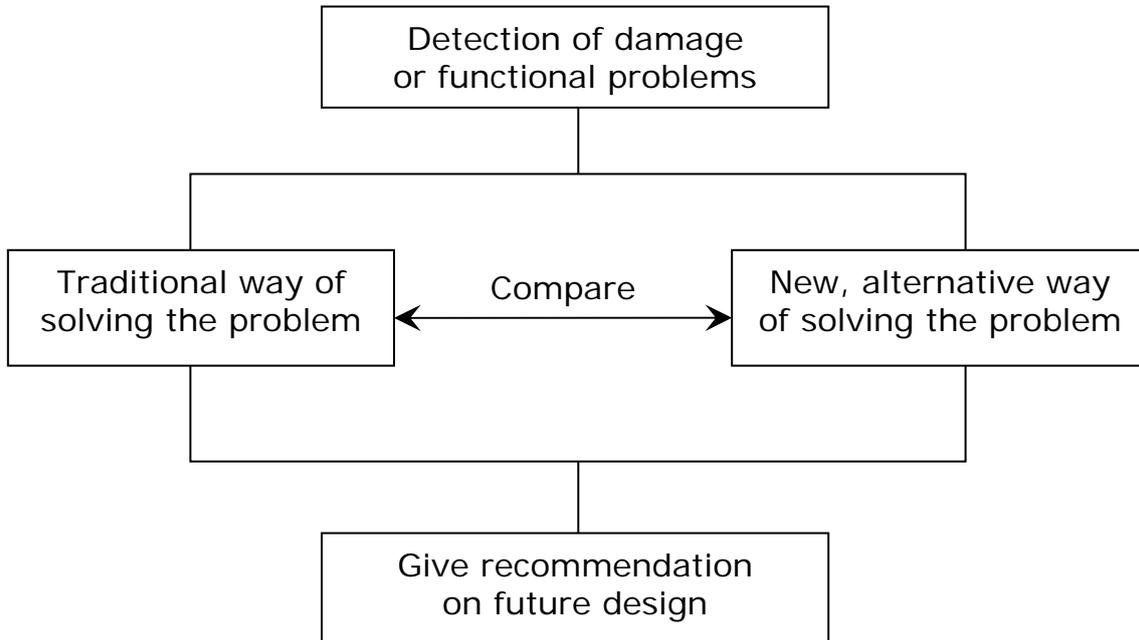


Figure 1. Principal of the study

#### 4.2. Projects on repair/rehabilitation from a major part of the world.

49 examples were received from approx. 60% of TC4.4 member countries and corresponding member countries. The examples came from North America, Japan, Europe, South Africa and New Zealand.

The examples cover all essential construction components (bridge decks, slabs, supporters, parapets etc.) and traditional and new alternative repair solutions for different causes of damage due to insufficient design, detailing, construction and maintenance and due to impact from traffic, fire, environment etc. or new political requirements. It is the task 2 subgroup impression that the forwarded examples are topical and that it is reasonable to anticipate that each country has forwarded their best ideas or examples on how to extend the life time, minimize agency cost and /or minimize working period and traffic restrictions.

All examples are divided into the following main and subgroups to have an easy access to the ideas from the examples:

• Structure (structural part)	• Deficiency
• 1. Whole bridge/culverts	<ul style="list-style-type: none"> <li>• 1.1 Insufficient load carrying capacity</li> <li>• 1.2 Deterioration</li> <li>• 1.3 Serviceability</li> </ul>
• 2. Superstructure	<ul style="list-style-type: none"> <li>• 2.1 Insufficient load carrying capacity</li> <li>• 2.2 Deterioration</li> <li>• 2.3.1 On slabs</li> <li>• 2.3.2 On beams</li> <li>• 2.3 Serviceability</li> </ul>
• 3. Substructure (pier and foundation)	<ul style="list-style-type: none"> <li>• 3.1 Insufficient load carrying capacity</li> <li>• 3.2 Deterioration</li> <li>• 3.3 Serviceability/settlement</li> </ul>
• 4. Bridge components or furniture	<ul style="list-style-type: none"> <li>• 4.1 Leaking of deck joint</li> <li>• 4.2 Insufficient or destroyed parapets</li> <li>• 4.3 Wearing/deteriorated pavement</li> <li>• 4.4 Wearing of painting</li> </ul>

4.3. Avoid traffic restrictions, postpone repair/rehabilitation works or use innovative materials.

The examples demonstrate that considerations about the free traffic flow and reduction of repair cost have been the major inspiration for proposing new alternative methods of carrying out the repair works.

Many examples are about reduction of working time and avoidance of traffic restrictions e.g. replacement of a culvert by relining a new culvert inside the old one instead of digging up the road for replacement, and about use of new materials e.g. strengthening of concrete beams or slabs with carbon fibre sheets instead of replacement.

Several examples deal with immediate cost reduction by postponing the repair works or reducing the rate of deterioration e.g. cathodic protection of reinforcement under corrosion. One example demonstrates how sufficient load carrying capacity (structural safety) can be demonstrated by using the high-level probabilistic assessment methods.

Many examples focus on cost reductions using new materials to eventually extend the life time of rehabilitation measures. One example of such an approach is the repair of a corroded steel culvert with fibre reinforced shotcrete.

It is TC 4,4's hope that the examples in this inventory will inspire agencies, consultants and contractors in similar situations to select the optimal maintenance or repair strategy.

The report has been prepared by a Working/Editorial group and will be finalized in June/July 2007.

## 5. TASK 3: APPROACHES TO COST EFFECTIVE MANAGEMENT OF BRIDGES

The analysis of the responses to the questionnaires that were submitted by more than twenty countries has provided an indication of the minimum data sets and processes that are required to conduct network prioritisation. Although different prioritisation philosophies have been adopted by contributors there is convergence in the data sets that are required. This is primarily in the bridge and road inventory items but to a lesser extent in the rated deterioration of components where there is significant divergence due to condition, damage and repair priority philosophies that have been adopted by the surveyed countries as a measure of component deterioration. However, regardless of the favoured philosophy, consistent, current and reliable inventory and condition data are essential to prioritisation of bridge maintenance interventions to facilitate the necessary data manipulation, analysis and reporting functionality.

Accordingly this document provides an analysis of the various network prioritisation approaches adopted by countries that have responded to the Task 3 questionnaires on “Cost effective Bridge Management” and concludes the basic data set and processes that are required to prioritise bridge maintenance interventions at the network level.

### 5.1. Introduction

The challenge in bridge management is to ensure that all bridges in a road network remain fit for their intended purpose over their' design life and beyond at minimum life cycle cost. Against this background, the PIARC Bridges and Related Structures Technical Committee identified the need to investigate the current practises in network level prioritisation of bridge maintenance interventions that have been adopted by a sample of member countries. The committee considered that a survey of member countries would be of interest both to countries with developed systems and those with systems under development. In the case of the first target audience group the study would provide a means of benchmarking existing systems or as a stimulus to enhancements, while countries that were developing systems would have access to a reservoir of information and contacts they could draw on to build or enhance similar capabilities.

### 5.2. Work and Data Flow Processes

The primary purpose of collecting and managing data in a bridge information database is to support objective and systematic bridge asset management. This includes the determination of the state of deterioration of the network and the gross funding needs to restore that network to a serviceable condition. Inevitably, the available funding and/or resources is insufficient to fully fund the required rehabilitation programme thus a funding constrained programme that addresses network priorities to meet defined vision standards and financial performance measures has to be developed. Accordingly, a moderation process has to be part of the programme development process and this can be external to or partly integrated in the Bridge Management System. The results of this survey indicate that all systems are subject to manual review and moderation. Additionally, processes to safely manage structures while maximising their' service/access level must be developed for those structures where intervention is deferred due to lack of funding. The basic requirements of the process are itemised below;

- The organisation will develop bridge performance measures/indicators and complementary performance targets or vision standards. The latter must be practical and affordable.
- Bridge inspection and deterioration rating will be a continuous and cyclic process that is conducted in accordance with defined processes by accredited personnel at specified frequencies.
- Bridge inspection data shall be uploaded or manually entered in the BMS within specified time frames and includes component and structure deterioration rating, compilation of maintenance backlog activities, estimates and perhaps maintenance priorities. A mapping of component deterioration states to appropriate maintenance activities and associated price books may be included in the system;
- The network steward will review the inspection and maintenance data for each structure and approve, defer or reject the proposed activities and develop and implement interim management schemes for critical structures pending development and implementation of the rehabilitation programme.
- The network steward will conduct network analysis in the BMS and produce the system-derived list of network priorities and unconstrained budget needs by comparing the gap between current performance and the defined network vision standards.
- A budget constrained programme is developed and distributed to strategic and operation personnel to develop the moderated programme.
- Management plans are developed and implemented for unfunded candidates.
- Performance of the assets and inspection and maintenance standards are continuously monitored through the inspection regime.

### 5.3. Analysis of BMS submissions

The responses to the questionnaires indicate the minimum framework required for the development of a BMS capable of conducting network level prioritisation. The basic outlines of the fundamental components are follows.

#### Governing Manuals, Specifications or Guidelines

Network level prioritisation is dependant on current, consistent and reliable data that is delivered by a number of subsidiary processes. It is essential that both the prioritisation system and the subsidiary systems are underpinned by appropriate documentation, methodologies, systems, training programmes and accreditation schemes.

#### Bridge Information Database Framework

- Minimum data set in the bridge inventory;
- Bridge inspection & component deterioration rating regime;
- Component and/or structure performance measures (indicators) and associated performance or vision standards;
- Prioritisation methodology and processes;
- Moderation processes.

#### Bridge Inspection Regime

A disciplined approach to regular cyclic inspections is an essential and basic prerequisite to provide current, consistent and repeatable component deterioration data for effective bridge management. Countries may differ in the rating philosophy but whether condition, defects/damage or maintenance urgency is adopted, the consistency and repeatability of comprehensive deterioration state data at the component level is essential. The report has

previously identified the various philosophies adopted and advice can be sought from exponents if required.

#### Bridge Performance Measures (Indicators)

The study identified various bridge sufficiency indicators however the comparative merits of these are outside the scope of this document but may provide a stimulus for the development of nascent systems or benchmarking of developed systems. If time permits a discussion of these factors will be included in the report.

#### 5.4. Analysis of Prioritisation Methods

The primary data and performance measures used by responding countries for analysing the bridge network and determining candidates for the bridge rehabilitation program are described below. These indicate a heavy reliance on condition, deterioration or other structural factors as would be anticipated in a bridge engineering system. Traffic impacts are the second most dominant factor which again is unsurprising however the relatively low weighting of financial considerations was not expected.

• <b>Parameter</b>	• <b>High</b>	• <b>Medium</b>	• <b>Low</b>	• <b>Sum</b>
• Financial Concerns	• 4	• 1	• 7	• 12
• Structural Conditions	• 36	• 14	• 3	• 53
• Traffic Impacts	• 7	• 10	• 6	• 23
• Geometrics Road/Bridge	• 1	• 3	• 4	• 8
• Road Impacts	• 2	• 4	• 4	• 10
• Social/Economic	• 4	• 5	• 9	• 18
• Design/Component	• 2	• 9	• 5	• 16
• Environmental Impacts	• 0	• 3	• 4	• 7
• Miscellaneous	• 4	• 5	• 6	• 15
• <b>Sum</b>	• <b>60</b>	• <b>54</b>	• <b>48</b>	• <b>162</b>

#### 5.5. Modification of System Derived Prioritisation Outputs

Issues of affordability in the context of "trade-offs" between maintenance requirements for other road infrastructure are considered outside of the scope of this process description. However, the prioritisation process must seek a balance of reasonableness for the bridge maintenance strategy, between the proposed performance targets, deficiency standards and funding need on the basis of acceptable practice, or community expectation (for example). Inevitably, the available funding and/or resources is insufficient to fully fund the required rehabilitation programme thus a funding constrained programme that addresses network priorities to meet defined vision standards and financial performance measures has to be developed. Accordingly, a moderation process has to be part of the programme development process and this can be external to or partly integrated in the Bridge Management System. The results of this survey indicate that all systems are subject to

manual review and moderation. Additionally, processes to safely manage structures while maximising their' service/access level must be developed for those structures where intervention is deferred due to lack of funding. The following considerations are evident both from the survey and the experience of the project team members.

- Validation of primary data used to select bridge maintenance program candidates.
- Packaging structures in jobs on a geographical and/or bridge material basis to increase delivery efficiency through minimisation of establishment overheads.
- Similarly, cross-district or cross-region packaging should be considered if organisational or economic efficiencies could be realised.
- Priorities within pre-defined intervention envelopes may be re-ordered in accordance with operational or local strategic imperatives.
- Structures that do not meet the target intervention levels may also be considered on the basis of an approved business case arguing over-riding strategic or operational imperatives. In this event it is essential that the proposal details how structures displaced from the programme can be safely managed.

#### 5.6. Management of Unfunded Priorities

Within the context of the prioritisation process, the bridge rehabilitation intervention standards in some instances may represent the minimum duty of care standard. If funding is insufficient to meet the entire network needs then the unfunded structures must be proactively managed to ensure the safety of road users and to mitigate the road network authority's duty of care and non-feasance liability. Typically structure specific management plans can be developed and implemented as a means of demonstrating responsible management of a network within available funding levels. The responsible authority has a number of options within this context as itemised below. It is essential that the condition of the structure and these plans are continuously reviewed pending the required maintenance treatment being effected.

- Impose height, lane or load restrictions;
- Impose detour or build side-track;
- Establish continuous monitoring process in cases where the initiation of progressive failure can be readily detected;
- Conduct a load test.

Whichever approach is adopted, it is essential that senior management and elected representatives are briefed on proposed network restrictions and that they are communicated effectively to key road transport bodies and other road users prior to and during their' application.

#### Glossary

*RMS* –Road Management System

*BMS* - Bridge Management System (independent or integrated with RMS)

*Bridge Rehabilitation* – Restoration of structure to original functional performance

*Capital Works*– Works that improve the functionality of the structure such as replacement, strengthening or modifications.

*Steward* – The owner's delegate with responsibility for the bridge rehabilitation programme.

*Deterioration State* – Measure of deterioration of a component assessed by an accredited inspector that can be in terms of condition, damage, defects or maintenance urgency.

*Significance Rating* – Measure of the load bearing criticality of a component.

*Risk* - A numerical score representing relative risk determined from a multi-criteria analysis.)

## 6. CONCLUSIONS

### 6.1. Improvement of Durability in Design and Construction

Durability issues are increasingly being explicitly considered as a major factor in the conceptual design, detailing, construction and maintenance of bridges in developed countries throughout the world. This is largely a reaction to the durability problems that have been experienced in bridges built in the last century in concrete and steel, and the high costs of rectification in often demanding trafficked environments.

Engineers have formerly often concentrated on ensuring the strength and buildability of these structures, but increasingly in the context of considering the whole life cost of such infrastructure, durability issues have assumed greater importance, and the related issues of inspection and maintenance regimes have received growing attention.

This survey, over a significant portion of the bridge stock of the PIARC membership contacted, illustrates the variable and complex nature of these issues and gives an insight into the current situation and a perspective of the future. Given the wide range of variables involved and the subjective nature of some of the enquiries made, it cannot be expected that a simple panacea for the problems associated with the durability of bridges would emerge. However there is considerable common ground over the significance of common durability problems, and the range of measures which are appropriate for the mitigation of such problems.

The following broad conclusions can be inferred from the study:

- For long term durability there must be an integrated approach to material specification, conceptual design, construction and maintenance, with durability explicitly considered as a major factor at every stage.
- Currently most bridge design depends on well executed traditional materials of concrete and conventional steels, with the impact of more modern materials (ref PIARC report) being slight up to present.
- The major durability problems in the existing bridge stock emanate from poor construction (e.g. low covers to reinforcement), leaking deck joints, chloride attack (often associated with leakage paths from failed joints) and deck waterproofing failure. The significance of these factors depends on the severity of the environment and specific design practices.

- Recognition of these problems has led in general to a shift in design concept for short/medium span bridges towards eliminating (or reducing) deck joints by adopting integral bridges (or favouring continuous decks).
- Design standards have and are continuing to respond to durability challenges by more closely requiring material specification to match the environmental conditions (e.g. use of cement replacement, general tendency to increase covers).
- There are already practices in some countries which may warrant closer study in severe circumstances (use of stainless steel rebar, cathodic protection etc.)

The data set provided by this study provides a valuable reference point for bridge engineers to take an overview of the situation in their own country, and contrast it with the situation in other countries with perhaps similar environmental conditions, but with alternative approaches to mitigating similar durability problems, which warrant closer examination. In countries where the bridge stock is less extensive, but where the continuing development of the economy will trigger rapid expansion of the bridge stock, the lessons learned by the problems/failures of the past and the developing solutions should provide a fruitful basis for developing their design philosophy,

## 6.2. Increase of Durability and Lifetime of Existing Bridges

Most examples include recommendation to avoid the same damage or problem occurring in the future. Essential recommendations are:

- Use joint-less bridges
- Hinges at mid span should be avoided
- Rebars in decks should be more resistant to corrosion
- Make every part of a structure accessible for maintenance, repair or replacement

## 6.3. Cost Effective Bridge Management

- Network level analysis is essential to identify investment candidates that will maximise the return from available funding levels.
- Consistent, current and reliable inventory and condition data are essential.
- Automated Bridge Management Systems are required, for all but the smallest networks, to facilitate the necessary data manipulation, analysis and reporting functionality.
- Various prioritization methodologies and attendant factors have been adopted by the surveyed jurisdictions however condition/deterioration is the primary factor in the surveyed systems.
- All surveyed countries conduct a manual review of the system derived investment candidates to take account of political, strategic, operational, social or budgetary constraints not considered in the automated analysis. The primary reasons for modifying the investment candidates are imposed budgetary limits or operational matters that dictate a diversion of funding to other infrastructure assets.
- Unfunded priorities must be actively and transparently managed to mitigate further deterioration, risk to users and legal liability.

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## **STRATEGIC THEME 4**

### **TECHNICAL COMMITTEE EARTHWORKS, DRAINAGE AND SUBGRADE (C4.5)**

### **ACTIVITY REPORT 2004-2007**

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## 1. WORK PROGRAM AND ORGANIZATION

Three main themes were studied during the 2004-07 session.

### 1.1. Promoting the optimal use of local materials

This topic is divided in two main themes:

- identifying progress in terms of soil and rocky materials treatment for road applications ;
- identifying progress in the use of wastes and industrial by-products as earthworks materials

These two themes will be presented in a single synthesis report published for the 2007 World Congress in Paris. Furthermore, a PIARC seminar will be held in Rumania from May 31<sup>st</sup> to June 2<sup>nd</sup> 2007 in which these themes will be the main focus of the discussions.

Initially planned, a third theme “How to ensure a good integration of road infrastructures in landscape” was eventually addressed only in a paper entitled “Road earthworks integration in landscape: retrospective of some cases in France”, to be published in the “Routes/Roads” journal, this theme being beyond the geotechnical scope and the skills of the technical committee 4.5.

#### *The first theme:*

was essentially analysed on the basis of:

- the results of a PIARC survey launched in 2005 during the TREMTI conference. This survey highlighted the main favourable and unfavourable elements to the development of soil treatment over the last years in about twenty countries;
- technical communications presented during two international conferences on soil and road materials treatment, respectively held in 2001 in Salamanque (Spain) and in 2005 in Paris (France).

It comes out from these elements that the economical benefits (transport, granular material savings), environmental positive aspects (limitations of borrow granular materials removal, restrictions to non compliant materials dumping) and the development of technical guidelines led to a large development in soil treatment techniques in numerous developed countries. Nevertheless, the lack of know-how, of adapted equipments, of local production for binders and even in some cases, negative experiences or penalizing climatic conditions have been detrimental to the development of this technique in some countries, and especially the developing countries, over the last two decades.

The main identified progress is dealing with equipment as well as treatment products, methods or technical guidelines. For example, the following points can be quoted:

- the development of powerful in-situ mixers, enabling mixing very coarse materials and reaching large efficient mixing depths (at least 50 cm), spreaders more and more accurate in terms of binders proportion and with variable spreading width, blocks pulverisers able to crush siliceous elements of very coarse materials such as flints clays, sprinklers burying water which enable a better moisture content control, screening and mixing buckets for small works sites as well as mobile treatment platforms;
- the introduction of low dust emission binders, enabling soil treatment in urban areas or sensitive rural areas, of specific road hydraulic binders, of fast setting binders, blast furnace slags fines, etc ...
- the treatment of dry and very dry soils treatment with lime milk, the introduction of the staged treatment method for soils containing sulfates, the application of recycled materials treatment (naturals or not), the transfer of treatment techniques from earthworks to road layers ;
- the development of guidelines in the last decade, in France, Germany, Belgium, United-Kingdom, Japan, ... as well as the publication of national and European standards.

*The second theme:*

was treated essentially on the basis of the answers to the survey carried out by the TC 4.5. in 2005 through its members. This questionnaire was intended to identify the wastes and by-products used in the different countries as well as the conditions for use in order to characterize these materials from both geotechnical and environmental aspects. In some cases, other documents (SESAR, ALTMAT and SAMARIS European programs reports) provided complementary information.

Fourteen countries answered to the survey : France, Croatia, Italy, Spain, Belgium, Portugal, Poland, Switzerland, Austria, Japan, Panama, Chile, Mexico and Rumania.

This survey does not give a complete picture of the world's expertise due to the limited number of countries who contributed to the survey.

Switzerland is noticeable for its application of a voluntary policy limiting the use of such materials. Similarly, Portugal doesn't show a significant will to promote the use of such products.

In a general way, all countries have specific standards, more or less prescriptive, governing the use of wastes and industrial by-products in road infrastructures. However, some countries such as Chile, Japan or Portugal, for example, don't have specific classification for such materials. On the other hand, all European countries have a common legislation, complemented in some cases by national standards.

The most common wastes and industrial by-products are demolition concrete (buildings and roads), old pavements bituminous materials, blast furnace slag, fly ashes, municipal solid wastes and also tyres, rubber materials or, more rarely, dredging slurries and cellulose wastes.

Some countries such as Croatia or Chile are have limited regulations related to the environmental issues.

The use of these materials is variable, depending on their nature and from one country to the other. However, the most frequent uses are in embankments, capping layers or as substitution materials. They are mainly used alone, rarely mixed and very rarely treated.

Except for Croatia, Switzerland and Portugal, a large development in the use of such materials was observed in road construction over the last decade. The main reasons are the lack of available good quality materials, the limitations to material disposal and, more generally, increasing sustainable development policies and the low price of these materials.

#### 1.2. Having indicators representative of the condition of geotechnical structures for road asset management.

While Road Asset Management is not a new concept, the primary focus has been on structures and pavement assets. To date there is relatively little guidance published on the management of geotechnical assets that underlies and supports these other highway assets. The purpose of this study has been to bridge this gap by reviewing current guidance and practice worldwide then setting out recommendations for future improvement in support of a joined up approach for road infrastructure management.

A PIARC report "Performance indicators for geotechnical asset management on roads – State of practice review" will be published on this topic for the 2007 Paris PIARC Congress. This report is mainly bibliographical, widely based upon the English experience in this area, and enhanced thank to a questionnaire proposed to the Technical Committee members and answered by 14 countries : Belgium, Italy, Poland, Switzerland, France, Japan, United-Kingdom, Greece, Nepal, Slovakia, Croatia, United-States (Virginia) and Canada (Quebec). This topic will be also presented and its applications debated during the PIARC Seminar planned to be held in Rumania from May 31<sup>st</sup> to June 2<sup>nd</sup> 2007.

The highway geotechnical asset principally comprises: embankments and cuttings, reinforced and stabilised slopes, subgrade and capping beneath carriageway, structural foundations, environmental / landscape earthworks, ground drainage and landscaping.

The challenge of the geotechnical asset is that there is more inherent variability in the engineering performance of such assets than is exhibited by most other elements of the highway network. This variability and the difficulty in predicting long-term performance poses a significant challenge to asset managers who are seeking to plan and budget the maintenance of their assets.

To optimise maintenance requires:

- condition information;
- an understanding of long term engineering behaviour of the materials and water;
- a proactive approach to maintenance activities;
- a holistic approach to any defects that might be identified.

At the core of such a managed approach is effective operational data management from which the condition can be assessed, performance monitored and analyses undertaken. Performance indicators are a key component in an asset management system and condition indicators are a specific type of asset performance indicator.

*A few recommendations*

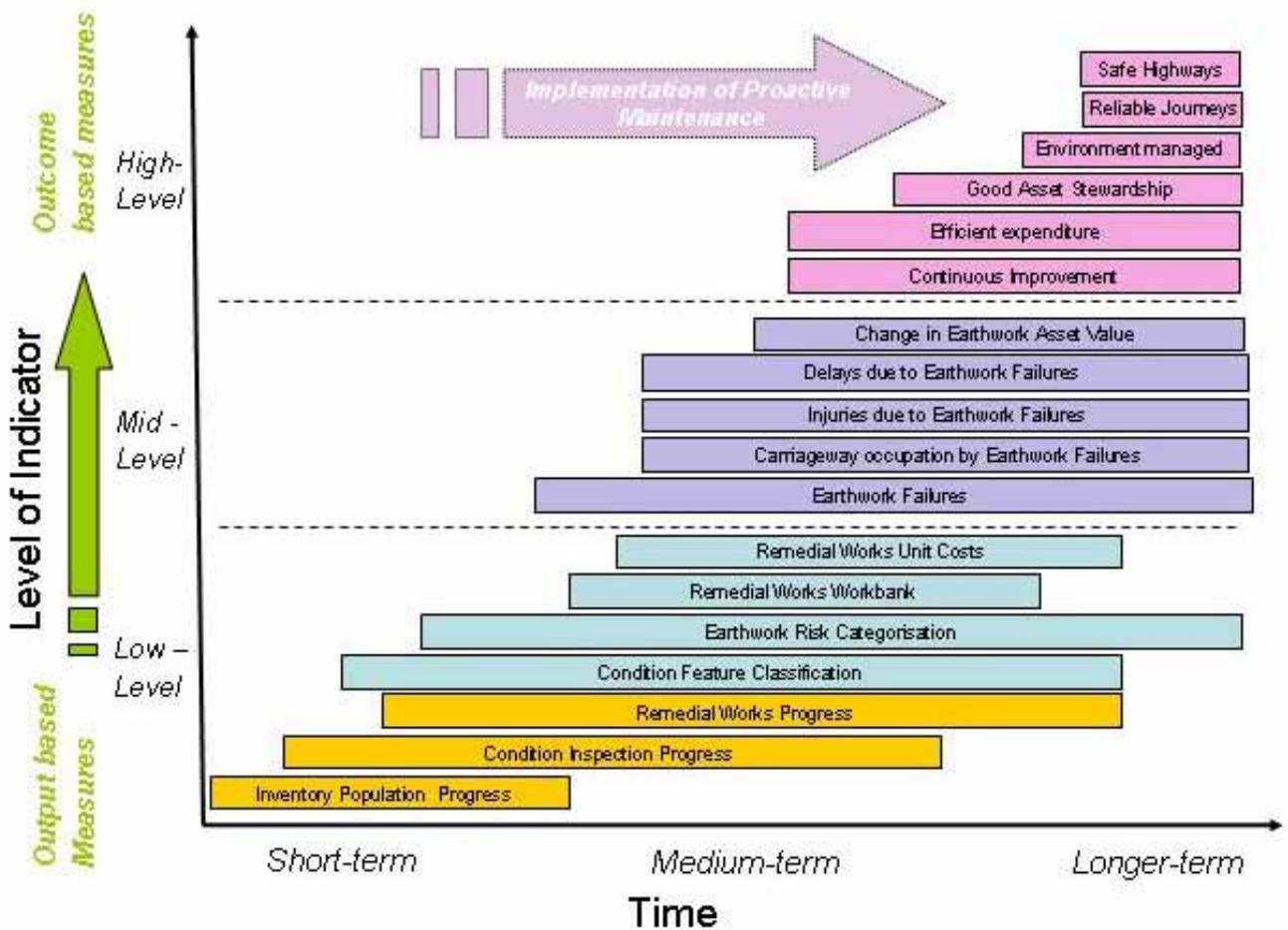
*Pro-active Asset Management*

Performance indicators are a vital component in an asset management system. They are both part of the management system and a key way of articulating good stewardship of the asset to other non-technical parties within the highway organisation and to customers.

*Performance Indicators*

Our work suggests that:

- a mix of ‘output’ and ‘outcome’ based performance indicators should be adopted for geotechnical asset management;
- a mix of low-level indicators used to manage a particular asset type, mid-level level indicators used to report performance to the overseeing organisation with high-level indicators to report to customers should be adopted with a distinction made between performance indicators related to the asset themselves and indicators related to the performance of the people running the network.



An outline 'roadmap' for the development of geotechnical performance indicators in a proactive maintenance system is shown the figure above.

### 1.3. Anticipating the impacts of climate changes

The climate evolution and its consequences on road infrastructures are one of the main preoccupations for the road Engineers at the beginning of the 21<sup>st</sup> century.

The initial objective of this topic was to prepare a report that would allow an evaluation of the predictable effects of the climatic changes and to propose some thoughts on how to control these effects in new constructions as well as for the management of all road assets. At first and considering the broad range of the subject, the committee decided to limit this work to an article for the Routes/Roads magazine.

Following the PIARC meeting held in Quebec city (August 2006), a brainstorming session was held amongst Committee members on the basis of early work carried out by the topic leader and it was then decided, at the Lausanne meeting (November 2006) to develop a complete PIARC report with the following sections. This topic will also be on the program of the PIARC seminar expected to be held in Rumania from May 31<sup>st</sup> to June 2<sup>nd</sup> 2007.

*The first part* of the report presents elements concerning the assumptions on climate evolution. A unique, worldwide climate evolution scenario does not exist. However, it is recognized that the mean global temperature is increasing and that some phenomena which were exceptional until now will happen more frequently. At the local level, a few countries or regions have established and validated evolution scenarios. Those from Québec and Switzerland are presented in this report. They illustrate that the expected evolutions will differ from different geographic regions and that, even for the same area, different scenarios might sometimes be promoted.

*The second part* is mainly oriented toward the availability of water in the soils: lack or excess and its effects on soil conditions. Using tables, this part recaps the predictable consequences of meteorological phenomena and proposes ways for solutions. The cases of embankments and of natural slopes have been separated because the nature of the problems for both configurations are different. The problem of the elevation of the sea, the permafrost modifications and the increase of the wind force, are also treated separately.

Preventive measures do not relay only to new structures, by taking the climate evolution into account at the early stages of design, but also the existing structures by proposing improvement and reinforcement works, advice for maintenance and finally repairing procedures when damages occur.

Some examples are presented in *the third part*. They show, more specifically, some damaged embankments and slope failures, due to the presence of water in excess. If they are not the actual fact of climate changes, these damages could eventually be attributed to it and their frequency of occurrence could increase.

The fourth part proposes steps to follow. It is emphasized that past and present experience does not constitute any guarantee of the future conditions if climate evolution scenarios for a specific region are not considered. General recommendations and process are presented which also consider the worse case scenario.

Based on probable climate evolution scenarios, the goal of this report is to sensitize engineers with the effects on road works and with the evaluation of new risks associated with climate changes to the works themselves, as well as for the users and the local residents. It proposes efficient preventive measures to control the soils and steps to follow to avoid later damages.

## 2. ACHIEVEMENTS (PAPERS AND EVENTS)

### 2.1. Papers

- *PIARC Report « Promoting the optimal use of local materials »* Submitted for publication at the 2007 World Congress. Main author : J.C. Auriol (France) with the collaboration of P. Garnica Anguas , G. Peroni, H. Havard, M. Samson, C. Drouaux, B. Dethy, J. Nomerange, S. Comenale Pinto, A. Parriaux, M. Oliveira, C. Kraszewski, O. Henögl, I. Mintas, E. Dapena, H. Miki, R. Andrei
- *PIARC Report « Having indicators representative of the condition of geotechnical structures for road assets management »* Submitted for publication at the 2007 World Congress. Main author : Mr. D. Patterson (United Kingdom) with the collaboration of G. Peroni, M. Samson, C. Drouaux, B. Dethy, I. Mintas, S. Comenale Pinto, E. Dapena, A. Parriaux, G. Grondin, J. Fortin (Canada-Québec), P. Garnica Anguas, H. Havard, J.C. Auriol, A. Mouratidis, M. Oliveira, A. Fuglsang (Danemark), O. Henoegl, Kraszewski, Fortunato
- *PIARC Report « Anticipating the effects of climatic changes »* Submitted mid-2007 for publication. Main author : C. Drouaux (France) with the collaboration of H. Havard, A. Parriaux, M. Samson, D. Patterson
- *Article in the Routes/Roads magazine submitted on the 1st of September « Integration of road embankments in the landscape: a look back and a few examples in France ».* Author : J.C. Auriol (France)
- *Article in the Routes/Roads magazine submitted early 2007 illustrating an example of integrating geotechnical elements in road asset management.* Author : D. Patterson (United Kingdom)

## 2.2. Events

Technical Committee 4.5 has organized or contributed to many events which contributed to the development of high quality international discussions on subjects related to earthworks, drainage and subgrade. Amongst which:

- *The meeting of the Technical Committee held in Tsukuba (Japan) on May 25th 2005 which included a workshop between members of the committee and their Japanese counterparts interested in the use of industrial by-products and local materials in earthworks. Eleven communications were presented during the workshop from different countries, including Japan;*
- *The meeting of the Technical Committee held in Mexico city (Mexico) on March 30 2006 which also included a workshop between members of the committee and members of the Mexican Association of roads. One hundred and twenty people attended this workshop and various presentations were made by members of TC4.5 and Mexican professionals. A CD of all the presentations was produced and distributed to all attendees on the following day ;*
- *The TREMTI Symposium (on the treatment of soils with lime and hydraulic binders) held in Paris with the collaboration of PIARC has benefited from many presentations from members of Technical Committee 4.5, who also participated actively in the Scientific committee of the Symposium. The October 2005 meeting of TC4.5 was also held in Paris, during the same week, to encourage a wider participation in the Symposium;*
- *The seminar « Earthworks in Europe » also held in Paris during that same week and also supported by PIARC has been well attended by members of TC4.5 who contributed significantly to the success of the event. It is foreseen that this seminar will be held again in 2008, in London, to repeat this type of discussions between European professionals.*

Technical Committee 4.5 is also contributing to another PIARC seminar held in Rumania by the Professional Association for Roads and Bridges, Moldavian section. This seminar will be held in Iasi (Rumania) from May 31 to June 2<sup>nd</sup> and the main theme will be : « How to adapt road earthworks to the local environment. ». This seminar will be a good opportunity for technical exchanges between Rumanian professionals and members of TC4.5. The distribution of a CD is expected at the end of the seminar.

## LITTERATURE REVIEW

Promoting the optimal use of local materials

Topic 1:

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Topic 2:

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