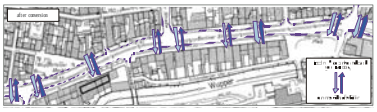
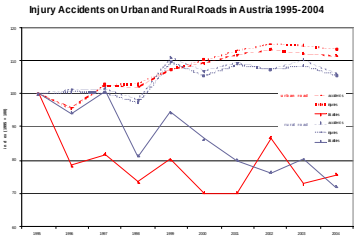
Association mondiale de la Route

World Road Association

PIARC Seminar, Committee C4-3
« *Urban Pavements*«
Krakow, Poland
21 and 22 September 2005

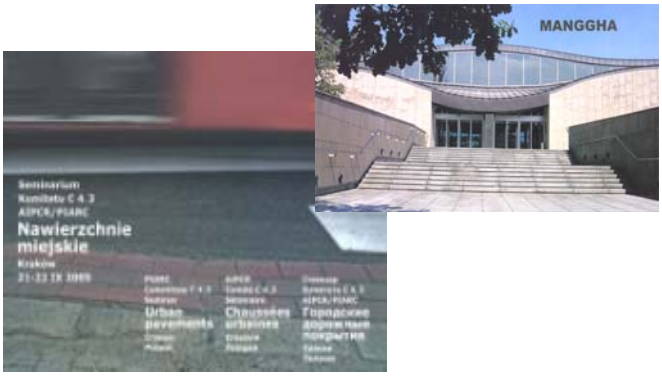










Synthesis of papers, debates and proposals

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July 2006

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INTRODUCTION

The world's population is becoming increasingly urban, and in industrialised countries often more than 85% of the population lives in cities. Public spaces, a large part of which corresponds to the urban roadway infrastructure, represent a major stake in both quantitative and qualitative terms.

Citizens are requiring more and more services, higher quality and harmonious functioning of the space in which they live and move, and this is translated by public contracting authorities into specifications covering the integration of such services, their durability, safety and, in general, all aspects relating to sustainable development. Many players are involved, including public authorities, occupants of surface and underground areas, operators of different travel modes, engineering firms, industries, professional bodies, various representative committees, etc., so that consistency and coordination become rigorously essential. Professional services, moreover, are witnessing considerable activity growth in many countries in relation to conventional road activity, in some cases exceeding 50% of all public works operations. Finally, governance in connection with the massive assets represented by the road infrastructures serving our urban areas is highly diversified as concerns both the number of administrators and their practices, so that the exchange of experiences naturally stands out as a particularly important factor.

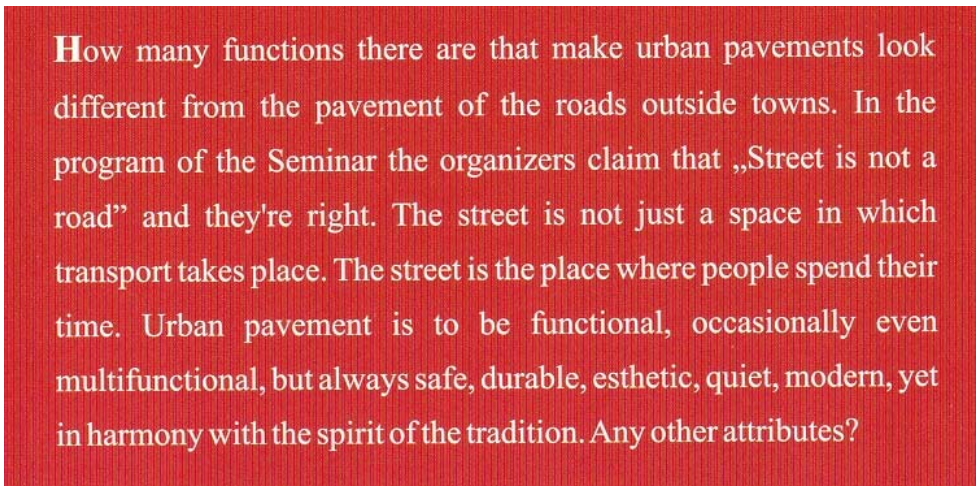
For all these reasons, PIARC Committee C4-3 decided to become active in the public space area, which was new to it, in order to contribute to its mission of identifying and disseminating the best practices in keeping with sustainable development, in particular in connection with the new target groups represented by local governments. From this viewpoint, the seminar seeks to provide food for thought and debate in a form to be defined for the 2007 World Road Congress in Paris, France, an emblematic venue in terms of urbanity.

The seminar, which brought together some 200 participants, was organised jointly by the PIARC Technical Committee C4-3 on Road Pavements and the Polish Road and Bridge Research Institute in Warsaw. It was sponsored by the Municipality of Krakow and the Secretary of State at the Infrastructure Ministry and enjoyed the material support of the road industry. Feedback from opinions of participants was quite positive as regards both form and content. Reference will be made to the following appendices, in conformity with the framework defined by the World Road Association for seminars falling under its aegis:

- Appendix 1: Seminar Programme
- Appendix 2: Overview of Evaluations
- Appendix 3: Seminar Overview Sheet

The problem considered was perfectly targeted, as mentioned in a particularly attractive manner in the seminar's announcement and registration brochure reproduced in Inset 1.

On the roadway, sidewalk, at the tramway stop and bus stop lay-by, on the bicycle route, on a square, a marketplace, on a park path, on a housing estate street, on the shopping mall parking lots, in the shopping arcade, university courtyard, truck terminal… Under the wheels of cars, busses, trucks, motors, cycles, rollerblades, strollers, under the feet of pedestrians…



Inset 1

The content and organisation of the programme took fully into account the specificity of the urban world in which the action of players, the human role, the provision of mobility for all, aesthetic and technical integration, the promotion of safety and pollution control, and the need for communication and social life are primary prerequisites. The technical objects represented by pavements, networks and equipment blur to the benefit of service and the ability to generate a specific environment representing a basic factor of a town's appeal.

The seminar strove to bring out this logic of service and integration in favour of which our techniques must mobilise the best of their potential and innovations must prepare the future. Thus, the first day, organised around the following three sessions, provided a view of the urban world, highlighting its issues, its specificities, its organisation and their consequences on public space design:

1 – Urban infrastructures: who is involved, with what resources?
2 – Issues and specific characteristics of urban roads
3 – Design of urban roads within public areas.

The second day sought to show how techniques and their use made it possible to fulfil all or part of the objectives and basic requirements discussed during the first day. It showed also how to meet more effectively the preoccupations of tomorrow in terms of environment, sustainable development and the minimising of environmental disturbance by means of some characteristic examples. Three sessions attempted to elucidate these different points for practitioners:

4 – Specific techniques and innovation
5 – Contribution to sustainable development
6 – Roadwork sites and operations on networks

In addition, the seminar attached great importance to the general debates, which made it possible through the interchange of questions and answers to broaden the overview of urban pavements, to restate and redefine the elements of the basic premise that "the street is not a road" and to provide elements in response to certain immediate preoccupations of urban designers and administrators, such as the fields of application for pavers and flagstones, the utility of surface draining materials, and the specific treatment of highway engineering structures in urban areas, to mention but a few.

Without claiming to be exhaust, we shall be looking below into some of the key points of the presentations and debates. A more complete view is provided by the CD Rom given to each participant and covering the greater part of the presentations.

Session 1 – Urban infrastructures, who is involved with what resources?

1.1 Mr Jerzy DUDA of the Krakow Urban Development Institute documents and analyses in great depth *The History of Urban Pavements*. Outstanding illustrations describe urban pavements characteristic of the

Roman period, the Middle Ages and modern times, and show how natural stone in the form of flagstones and then pavers modelled urban space in total harmony with users consisting of pedestrians and horse-drawn traffic. The last century saw the development of other paving materials, notably macadam, concrete, and black products the use of which is becoming increasingly widespread. But, today, through the use of natural stones in urban paving, new emphasis is being placed not only on aesthetic considerations but also on the preservation of the historic values attached to national cultures and which participate fully in bestowing a human and social dimension on our cities.

Illustration proposed by Jerzy DUDA (Poland)

Photo proposed by
Jerzy DUDA (Poland)

1.2 Mr Guy BEURIER of the Association of Territorial Engineers of France (AITF) oriented his presentation on *urban technical governance*. Like is shed on the complexity of public space with the great variety of urban roadway "clients" and the superposition of management levels, giving the example of a roadway on which five local authorities share responsibility for managing the public domain. Communication, coordination, partnering and co-design are naturally called for. This ability to work together has beneficial effects on State/Industry/Association/University partnerships which are led to produce common tools. Reviews become a factor of consistency, ensuring that a recognisable local image emerges for the citizen who embraces the public space. The exchange of experiences and international cooperation on these complex governance matters are acknowledged to be areas requiring further development.

The street is not road

Photographs proposed by Guy BEURIER (France)

1.3 Mr Hennie VAN DER SCHYFF of the city of Johannesbourg, South Africa, presents feedback from experience relative to the *Reclassification of Traditional Earth and Gravel Surfacing as Pavements*. He describes the major impediments to mobility and to the environment encountered in Soweto near Johannesburg caused by defective drainage accompanied by erosion phenomena. Dust or mud and stagnant water during rainy periods deteriorate available service to very poor levels incompatible with social and economic development.

1.4 The author shows the successful impact of the rehabilitation of some 350 km of roadway on the quality of life of inhabitants. This type of project represents a powerful social force helping to instil personal responsibility while gaining popular acceptance. It offers an example of the effective handling of the problems experienced by countries in transition and developing countries in which engineering seeks primarily to fulfil social objectives relative to development and quality of life. This could be achieved only after local communities succeeded in developing the appropriate methods, tools and know-how.

THE PROBLEMS

Photographs proposed by Hennie VAN DER SCHYFF (South Africa)

Photographs proposed by Hennie VAN DER SCHYFF (South Africa)

Session 2 – Issues and specific characteristics of urban roads

2.1 Mr Wieslav WANKOWICZ of the Krakow Urban Development Institute presents *transport issues in urban planning*. Transport networks in the city of Krakow are extensive, interlinked and highly diversified, with explosive growth in travel demand. The number of vehicles on the road has doubled in 10 years. Highway facilities consist of 760 km of municipal roads which include a large number of bridge and tunnel structures. About 170 km of tramway lines are deployed throughout the city, linking with the other public transport modes: buses, minibuses, etc.

As in many cities, studies are conducted, improvements made and rules implemented to control traffic and prevent environmental disturbances that could be caused by an "all automobile" society. In urban areas delimited by a green belt of exclusively pedestrian concentric zones, controlled access zones for vehicles as well as limited parking zones are provided, enhancing the quality of urban spaces. Priority is given to pedestrians and to public transport in terms of accessibility, comfort, commercial speed and operating priority. Significant investments are mobilised for this policy which does not overlook cycle traffic or "calmed" areas. This generic approach describes well the overall logic used in many towns seeking to conserve or return the town to its inhabitants.

2.2 Mr Thomas FESSL offers detailed statistics on *Road Safety in Urban Environments in Austria*.

He compares the saturation of urban roads in relation to rural roads and points out that accidents are more frequent in urban areas (two thirds) but less serious and involve populations which are more fragile in this regard, i.e. cyclists and pedestrians with greater casualties among the aged in the latter case. According to the author, the observation of a greater number of accidents in medium or small towns is explained by the reduced availability and use of public transport, with the resulting greater number of cyclists and more travel from the suburbs.

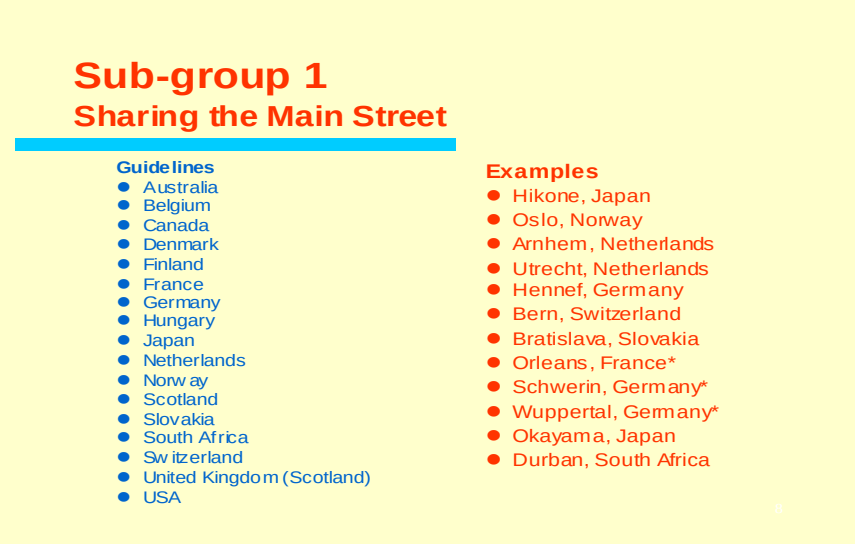
Austrian public authorities are fully in phase with preventive measures identified by the community of European towns, namely:

- urban management focusing on safety,
- a high level of service for public transport and soft travel modes
- education and dissipation of misconceived notions
- speed calming improvements and measures
- tools for predicting and observing the effects of road safety improvement plans.

Session 3 – Design of roads within public areas

3.1 Mr Bystrik BEZAK of the Technical University of Bratislava, Slovakia, presents the data collected and analysed by PIARC Committee C 3-2 "The town and integrated public transport" relative to the *sharing of urban road space*. The purpose of this work is to define an inventory of solutions in catalogue form for appropriate sharing of the main streets of our towns with respect to the different transport modes.

It is difficult to reconcile all the functionalities of a main street: access to shops, space for pedestrians, place of work or residence, vehicle traffic, rest areas, restaurants, schools, public spaces, places of worship, etc. All countries have similar problems as concerns traffic levels and speeding, poor access for pedestrians and cyclists, specialisation of buildings, and so on, with limited and rare space, so that sharing becomes difficult. Nevertheless, possibilities for action exist such as those described with regard to the towns of Wuppertal in Germany, Durban in South Africa and Bratislava in Slovakia.



Advantage/drawback assessments carried out on different sites show that there is no universal systematic recipe. Recommendations include:

- not to review the design unless there is an established need to do so,
- carefully combine the functionalities
- avoid uniformity that may become monotonous
- provide more space and make it more attractive for soft transport modes (green areas, urban furniture, meeting and rest areas, reduction of disturbances and pollution, etc.).

3.2 Mr Jean-Pierre CHRISTORY of the French Transport Ministry (LROP West Paris TR Laboratories,) underscores some basic aspects of the urban infrastructure area as well as *related current and future issues.*

This presentation reformulates the need for global and multidisciplinary methods in urban areas and the benefits expected from design approaches which make use of functional analysis. Designers must bear in mind the importance of considering the question "the street in the service of whom?" in any design or redesign undertaking. Also stressed is the strong desire observed today for more human cities. The perception of a space, and hence its functioning, in terms of the behaviours that it generates among an urban population is significantly influenced by the geometry and choice of surfacing materials which, on average, represent 30% of the visual field of a person on the move. The very rich gamut of surfacing materials used in urban areas facilitates the fulfilment of needs in this context.

Urban travel plans constitute a new factor in achieving efficient urban space sharing and better organisation of travel with the significant development of high capacity surface public transport facilities: buses, guided systems on tyres, rail tramways. Sharing reaches far beyond the geometrical assignment of the public spaces between built-up areas. It extends to ground, above-ground and underground networks; it also encompasses time-shared multipurpose spaces and hierarchised choices in connection with plantings, urban furniture, and sewer and utility network structures. Finally, public space plays a growing role in the preservation of the environment by increasingly requiring roadways to contribute to noise abatement, to the reduction of pollution conveyed by rainwater and even to the control of air pollution and temperature reduction.

Recycling and the saving of energy and non-renewable constituents are also constant and important preoccupations of contracting authorities in the urban civil engineering area.

The conclusion of these observations is that urban roadways represent an area in which there is a great demand and need for innovation and that the technical community as a whole must strive to ensure that innovative undertakings are promoted and allowed to develop favourably and sustainably.

Photographs proposed by Jean-Pierre CHRISTORY (France)

3.3 Mr Marcel SMETS, chief architect of the Flemish region of Belgium, deals very eloquently with the subject of *public space improvements*, focusing his demonstration on the study of an emblematic case concerning the redesign of the railway station district of the city of Louvain. The initial situation is that of an historic city cut off from its exterior districts by impressive railway infrastructures with poorly designed links, for pedestrians in particular, and many dilapidated buildings and barren spaces.

Photograph proposed by Marcel SMETS (Belgium)

The idea was to make the train and the station a new factor as well as a new asset for the city by implementing a project in three phases:

1/ treatment of road travel opposite the station by the provision of much more open spaces,

2/ treatment of large spaces around the station with the construction and rehabi-litation of multipurpose buildings and offices, using enhanced land models allowing the utilisation of levels and ensuring appropriate distribution between green areas and parking facilities,

3/ treatment of multi-modal links between automobiles, buses, trains and pedestrians with underground parking areas and the construction of a tunnel road.

The emergence of an improved underground activity is witnessed, with accesses to all directions and for all uses: parking, new bus terminal, shops, etc. The glazed footbridge for pedestrians is an appealing contribution softening the stream of vehicle traffic underneath.

The goal was achieved by the construction and integration of new infrastructures taking into account the specific nature of the urban environment and making the city's entrance and exist more pleasant for all users thanks to this new centre of attraction.

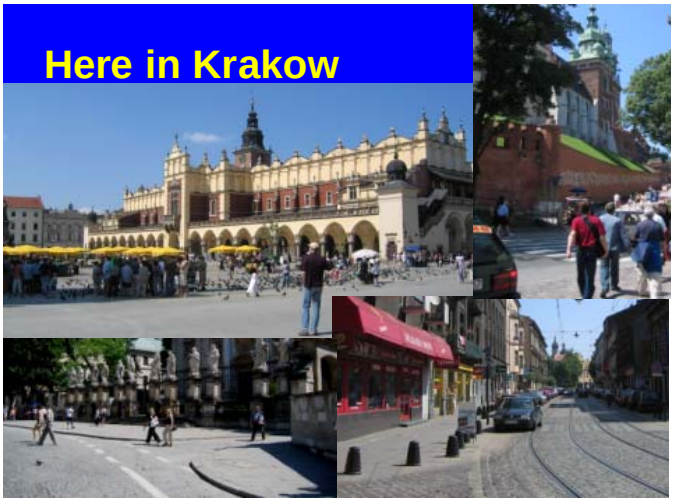
Session 4 – Specific techniques and innovation

4.1 Mr Egbert BEUVING of the European Asphalt Pavement Association (EAPA) describes the *range of pavement materials used in urban areas*. Functional requirements as well as aesthetic aspects play an important role in the choice of materials in urban areas. Local conditions interact greatly with the final selection which contributes to the image of the city, including its historical dimensions.

Pavements must be comfortable, safe, durable, recyclable and without an impact on the environment while still affording easy construction, maintenance and repairs (trenches). Pavements in urban areas must often be aesthetic, suited to the environment and not liable to cause or transmit vibrations.

A wide range of materials is available: concrete, bitumen, precast products, modular elements. They offer an extensive choice of colours, textures, forms, and combinations between several products and techniques make it possible to reinforce the identity of public spaces and functional sharing elements.

The final selection also depends on thresholds, maintenance facilities, costs, and so on. In every case, choices are more effectively made in close collaboration between the engineer and the architect.



Photographs proposed by Egbert BEUVING (Pays-Bas)

4.2 Ms Anne BEELDENS of the Brussels Centre for Road Research (CRR) illustrated the *potentialities of concrete as an architectural design material*. Colour, texture obtained by deactivation, interfaces with modular paving elements and sewer and utility network structures, as well as aesthetically harmonious combinations with natural stone and terra cotta, are effectively controlled today and constitute significant assets in meeting the particular integration requirements of each project and each urban area. Examples of projects in Duisant, Saint Hubert and Antwerp show the high integration levels achieved in a sustainable manner through compliance with the rules of the art and the care given to design and execution. In many cases, the use of fresh concrete in two successive layers constitutes one of the keys to the aesthetic, technical and economic success of the projects.

Concrete also offers promising potential with respect to air pollution generated by automobile traffic. Research and experiments on concrete paving blocks surface-treated with titanium dioxide show a reduction in nitrogen oxides by photocatalysis with light under certain conditions.
Confirmed in the laboratory, the principle is to be validated on a large scale on service areas. Initial evaluation elements are expected from a surface area of 40,000 square metres of side roads surfaced with concrete paving blocks treated with Ti02 in Antwerp. Other promising tests have been conducted in Japan and Italy.

Photographs proposed by Anne BEELDENS (Belgium)

4.3 Catherine PANKOWSKA of the French department (region) of Hauts de Seine presented the *concept of surface public transportation in the Hauts de Seine region* applied in the immediate vicinity of Paris. Owing to the economic importance of this area, including in particular the La Défense business district, the priorities set and efforts made by the regional council responsible for local governance as well as the provided organisational and human resources constitute a coherent whole suited to situations of this type encountered in large urban areas. Regional authorities thus contracted for the completion of specific technical studies such as the document titled "Surface public transportation platforms: inventory and choice of surfacing for structures." This guide, the aims and basic elements of which were presented, includes an inventory of the platforms and a description of the loads handled and the design principles applicable to guided and non-guided public transportation systems.

Photographs proposed by Catherine PANKOWSKA (France)

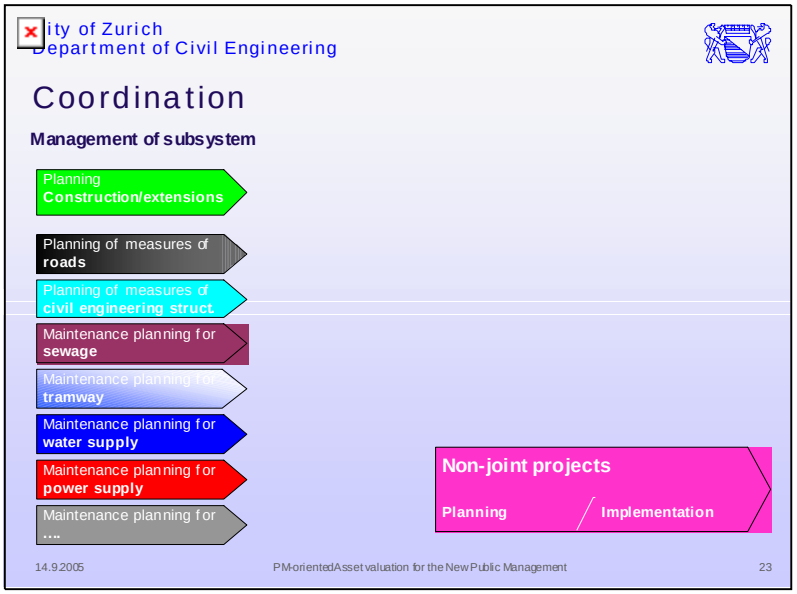
The actions undertaken in the Hauts de Seine region are meant to be both global and instructional, in the service of local authorities in charge of the integration of the region's different transport modes. The importance of the fast embracement of a culture in terms of public transportation is stressed.

Session 5 - Contribution to sustainable development

5.1 Mr Martin BÜRGI of the city of Zurich presents the methodology and the results of the approach and the tools implemented by the city of Zurich for *Road Asset Management*. In addition to the 737 km of roads and 643 structures such as bridges, tunnels and retaining walls that constitute the city's main road assets, it is also necessary to take into account the utility networks running under the roads and which have their own life cycle and their own asset value. It is this relationship between roads, structures and utility networks that allows a realistic vision of the planning of actions. Coordination is at the core of the pragmatic approach used by the city of Zurich and, in this sense, the case described is a valuable example.

After an inventory of the objects related to the urban infrastructure, a replacement value is determined and combined with an ageing factor (age coefficient) in order to determine an annual depreciation value. The planning of actions is defined on the basis of a management model which simulates the evaluation of resulting costs and obtained performance. The consequences of budgetary decisions are also clearly set forth with the corresponding impact of changes on the transport infrastructure service levels offered to citizens. Managers can thus determine precisely the potential effects of high and low quality objectives in relation to the average situation corresponding to the budgetary effort made.

By thus combining sound management principles and a technical foundation, this approach has enabled the city of Zurich to achieve greater transparency in allocated budgets and to support decisions oriented on at least what is needed if not what is desirable. This overall predictive approach avoids nearsighted decisions which have a tendency, in the absence of an "alert" system, to shift on to future generations the efforts needed to maintain quality infrastructures.



Organisation diagram proposed by Martin BÜRGI (Switzerland)

5.2 Mr Nagato ABE, member of the Japanese delegation, presents, on behalf of Mr Nasahida ITO of the Ministry of Urbanism, Infrastructures and Transport, an inventory of technologies used in Japan for the *construction of ecological pavements in urban areas*. The aspects covered include:

- reduction of $C0_2$ emissions,
- asphalt recycling,
- control of runoff water by means of porous structures and surfacing,
- heat-limiting pavements,
- absorption and transformation of nitrogen oxide.

Low temperature asphalt pavements contribute to the reduction of $C0_2$ objectives assigned to industrial firms. This is obtained by the incorporation of micro-bubbles making it possible to improve the cold working properties of bituminous mixes. Correct compacting can also be obtained at lower temperature. Recycling techniques are widespread in Japan where almost all bituminous mixes and cement concrete are recycled. Roadways and footpaths making use of permeable materials are used to reduce flooding risks.

As concerns reservoir pavements, the solution involving the distributed infiltration of rainwater through porous surfacing and a permeable roadbase is the one used most often. The water is evacuated either by infiltration in the ground or through drainage systems and a drainage trench outside of the structure when the soils are impermeable. Test benches make it possible to measure the hydraulic efficiency of typical structures.

The above-mentioned techniques are used in many industrialised countries. On the other hand, the following two techniques exhibit a more marked innovative character, introducing new criteria in their relationship with roadway design, namely the lowering of temperature in towns, on the one hand, and the reduction of nitrogen pollution on the other.

Temperature reduction in summer is obtained by means of porous surfacing using a cementitious matrix, allowing the retention of water whose evaporation enables the absorption of part of the energy striking the pavement surface. Another process involves the use of aggregates consisting of hollow ceramic particles and a pigment allowing the reflection of infrared rays. Simulations show that, on a footpath of child height, temperature can be reduced 2°C on average, which is not negligible in hot summer weather.

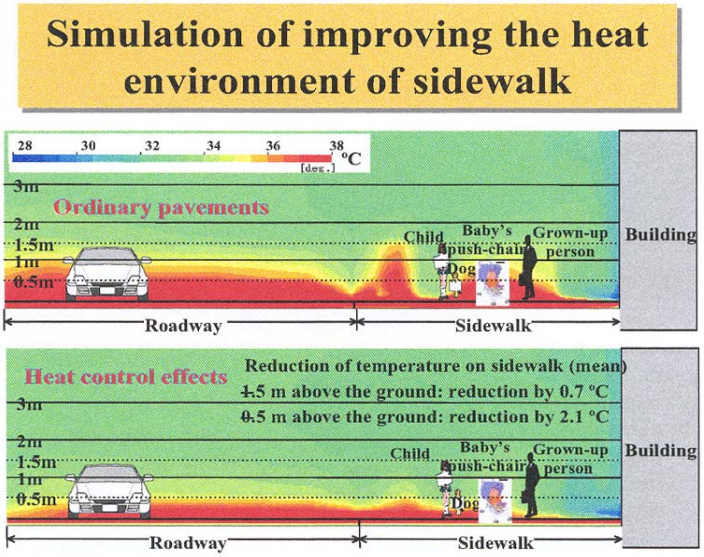


Diagram proposed by Mr Nashida ITO and Mr Nagaté ABE (Japan)

The reduction of nitrogen oxide generated by automobile traffic can be obtained by the photocatalytic effects of $Ti0_2$, a technology invented in Japan and which is beginning to be evaluated by several industrialised countries in Europe (Cf. Presentation 4.2).

The speaker points out in his conclusion that these different techniques are not yet used routinely in Japan, but that pressure relative to the environment is calling for priority to be given to efforts being made to bring them to the operational stage.

5.3 Ms Sally ELLIS of the United Kingdom presents feedback relative to the *integration of guided bus lanes within the urban environment*. Traffic congestion control efforts in urban areas combined with the chronic lack of space leads to the development of right-of-way lanes for buses and other public transport systems together with guiding systems which allow a very good level of path control and the use of reduced widths.

Different guiding systems exist and are illustrated by examples coming from Germany, France and Austria in addition to many installations in the United Kingdom. Simple platform systems in continuously reinforced concrete with guiding borders yield satisfactory results while offering performance equal to that of rail guided systems.

Photographs proposed by Sally ELLIS (United Kingdom)

Limited costs, high design speeds, small space requirements, mechanised installation systems, such are the advantages of these guided bus systems whose effectiveness also requires appropriate signalling to ensure safety of movements with possible priority given to the bus lane. Prevention systems do not allow private vehicles to enter the right of way. The appeal of public transport thus becomes tangible by embodying the concept of the "High service level bus."

Session 6 – Roadwork sites and operations on networks

6.1 Mr David HEIN (Canada) reports on the work he is directing within PIARC Subcommittee C4.3.3 relative

to the *Impact of road construction and maintenance activities on road users and on adjacent road use.*

The value of this approach which is be included in a PIARC guide is its overall view taking into account the viewpoint and the impacts of roadworks on all the players of the road and street: local residents, travelling users, execution personnel, operator, etc. This integrated approach is brought out immediately by the evaluation and hierarchisation of components of disturbance due to roadwork sites: hazards for the public and workers, impeded travel and accessibility, noise, air, water and soil pollution, various other nuisances involving odours, unsightly conditions, etc. Most administrations have rules and guides concerning these preoccupations and which set thresholds not to be exceeded, criteria by criteria, but there are still few tools for evaluating overall impacts, hence calling for major conceptual innovations in this regard. It is up to the PIARC to promote this type of tool on the basis of better practices. Already, the work of the group makes it possible to identify relevant areas such as the location of lanes occupied by works, the evaluation of offers for an overall cost including the infrastructure and the cost of disturbance to users, clear information to the public, speed calming and control, tentative valuation of any area potentially available for traffic, etc.

In addition to these questions of organisation, the choice of construction or rehabilitation techniques is also of primary importance. Precast products, in-place recycling techniques, and removable safety barriers are areas in which accelerated development is warranted owing to the desire of citizens for efficient travel free of disturbances at every stage, whether as relates to the life cycle of infrastructures or more generally to transport systems.

Photographs proposed by David HEIN (Canada)

6.2 Mr Herwig KLINKE of the city of Vienna, Austria, reports on the efforts made by his municipality to *manage roadworks and operations on networks*. There are significant road infrastructure assets: 2,800 km or streets including 450 km of tramway lines and 54 km of engineering structures, 42,000 km of buried networks and 10,500 trench openings annually.

Careful planning and proper preparation have guided the city's administrators, and the care given to space-time coordination has also been of primary importance. Many streets in Vienna are at their maximum capacity in terms of traffic and call for a panel of solutions, to be studied case by case, to reduce as much as possible the disturbances due to traffic. The "work at night" solution is adopted only exceptionally because, although faster and not generating traffic congestion, it involves drawbacks such as noise which is not acceptable to the population, costs which are 45 to 55% higher, and reduced execution quality.

Diversions, works under traffic and works during holiday periods are alternatives to be used on a case by case basis, being careful to ensure an overall balance so that the advantages related to these solutions are not outweighed by such disadvantages as the excessively seasonal nature of contractor activity, hazards to users caused by frequent alternate lane and public space changes, the shifting of disturbances to other inhabitants, etc.

This subtle balance is considerably reinforced when an up-to-date communication system offering consistent legibility and diversity is put in place. Among the public relations tools, information which is widely disseminated before the start of the works, frequent press releases, clear pamphlets and posters intended for residents, Internet information sites and district meetings have shown their effectiveness in reducing complaints and promoting acceptance with regard to works.

6.3 Ms Christine LEROY, of the Paris township technical department, discusses the experience of the city of Paris and more generally of the community of engineers of French towns with regard to *urban pavement constraints and trench treatment*. The presentation deals with issues concerning contracting authorities and the response of contractors.

In addition to the extreme space requirements and confinement of urban worksites often located on historical sites, the operations are characterised by the large number of players and the many services that must be remain uninterrupted. The populations embrace ownership of the street (the street is my garden) and behave accordingly: availability, accessibility, safety, security, aesthetics, absence of disturbances, are thus major requirements.

Public authorities have organisation rules and incentives designed for these objectives: coordination procedures guaranteeing the 3-year integrity of pavements, mandatory barrier and right of way protocols, consistent communication systems, support for organisational and technical innovations, observatories, etc.

Under the stimulus of the city, contractors comply with this collective concern for minimum disturbance to citizens and promote the positive image that the construction industry wishes to bestow on its trades and activities. It must be said that contractors are constantly present on a road network of some 1,600 km on which about 12,000 excavations are carried out every year.

Contractors, who work on the basis of urban professional qualifications, make great efforts to adapt their technical processes and their equipment to the constrained logistics of urban areas. The use of power shovels with a small rotation radius, low noise equipment, on tyres in preference to tracks, use of waste vacuum lorries, as well as the reduction of fumes and dust are operational solutions today.

The choice of unconventional techniques and innovative solutions is also an extensively used approach. In-place recycling of trench waste by means of compact mobile installations, the use of self-compacting materials, urban microtrenches for certain utility networks, and the optimisation of new materials coming from industrial coproducts are being used increasingly in French cities.

RECYCLING IN SITU : filling with cement mixture

Photographs proposed by Christine LEROY (France)

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CONCLUSIVE DEBATES

The debates that followed the presentations were lengthy and it is not possible within the allotted framework to look into their content in an exhaustive manner. We shall confine ourselves to listing some dominant elements which may reflect the ideas emanating from the sessions.

1 - The urban environment is very different from that of the road. It involves the interaction of many players in a very complex and evolving setting. To meet its needs, it is necessary, for pavements for example, to take into account aspects relating to both aesthetics and integration and to make rational choices as concerns materials. It is often difficult to opt between these two aspects. This entails teamwork calling for greater attentiveness on the part of technicians with respect to the design solutions of architects, and better training of the latter in technological matters. Working together to mutually broaden one's vision is an important requirement for better project design and in seeking to achieve progress towards more attractive and more human cities.

2 - The urban environment is a source of innovations driven by the ever-higher performance and quality requirements of users on the move, occupants of the public domain and local residents. New environmental criteria are taken into account: pollution of surface air, heat reduction, routing and filtering of water by porosity, to give but a few examples. These innovations, strongly supported by large towns and conurbations, require validations and evaluations in order to determine their potentialities and fields of application. It is important to avoid the risk of adopting techniques enjoying a certain popularity based only on their appealing image. The question of environmental sustainability in relation to the mechanical sustainability of materials must be considered. Use must be made of indicators that track the techniques, measure their effectiveness on real sites, and consolidate the results within observatories set up on the initiative of public authorities and whose design and operation must fall within a close partnering framework.

3 - The urban environment also lives with the seasons. Temperature, heat and frost, precipitations, condensations, etc. influence the use that citizens make of their public spaces. Design and operation must take into account the expectations of all users and in particular those of reduced mobility, as well as all travel modes, including the most novel, such as rollerblades.

4 - The urban environment represents considerable assets and, in this respect, calls for particular attention in terms of asset management. This discipline is particularly difficult owing to the large number of users of urban infrastructures and the many objects or interfaces that characterise them. Despite the validity of some research conducted in the aesthetics field, excessive variety of materials must be avoided lest their evaluation, management, repair and replacement become impossible. In the case of composite surfacing materials chosen to create an atmosphere, it is necessary to invent those design, construction and management systems that take full account of the singular and sensitive points constituted by interfaces between surfacings of different types, or objects of all kinds such as rails, emerging utility network structures, etc..

5 - The urban environment complies fully with the principles of sustainable development. Recycling and the treatment of waste and coproducts from urban activities are today inescapable adjuncts in many countries. However, the street is a sensitive setting and must in no case be perceived as a waste dump. The presence of utility networks in town is both a source of complexity for the required traceability of recycled products, and a source of opportunity for the reuse of materials as trench backfill.

6 - The urban environment must thrive on the exchange of experiences. The handling of all the above-mentioned issues can best be addressed by today’s ever-increasing international exchanges.
The formulation of methodologies and conceptual frameworks, capitalisation on feedback from experience provided by observatories, and the publication of data sheets by committees of representatives coming from the urban environment would make it possible to progress faster in the dissemination of best practices in keeping with the specific complexity and sustainability that characterise our towns.

May the PIARC contribute to this endeavour through its renewed and extended action aimed at meeting the major preoccupations of local governments.

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RECOMMENDATIONS PROPOSED FOR THE PIARC

- The road to development goes through the development of the road – such is one of the strong founding ideas of the World Road Association for identifying and disseminating best practices. This notion covers all countries, whether developed, in transition or developing, and all interurban, periurban and urban areas. The PIARC's force must also lie in identifying and mobilising the synergies between all these worlds.

  The field of the road is to be considered today in its entirety as a technical object, an object of service, and a place of synthesis for sustainable development and for the application of the new "systems" logic. The juncture seems right for the PIARC to further activate this approach, considering that the above-mentioned values are also very widely shared within the world of urban infrastructures and services. The synergy between the road, the street and public space stands out today as an essential tool for preparing the roads and streets of the future, along with the efficient transport systems of tomorrow that the PIARC has the vocation of anticipating.

  In the emerging countries represented by most PIARC members, urban development goes hand in hand with economic development. The regional mutations taking place are bringing about a considerable quantitative and qualitative rise in the transitions and interfaces between roads and streets.

  In every country, interurban, periurban and urban travel infrastructures form a whole which is working increasingly as a "meshed system" calling for joint progress in terms of the organisation and management of ground, above-ground and underground structures, and asset management methods articulated around the minimising of disturbances to users and local residents, to mention but a few examples. The PIARC can be an essential player in the required interaction of skills and trades embodying the idea that the road renders service to the street and the street renders service to the road.

- At a time when the international technical community is anticipating with regard to the futuristic vision of transport systems for the years 2020 to 2040 if we consider the different European projects (e.g. Transportation Research Board – TRB - Conference), it is observed that the logic of sustainable development leads to another view of the road, with new sharing between the different functions: travel, curative and predictive safety, and simultaneous allowance for all environmental components (air, water, vibration, aesthetics, heat, energy, health, etc.).

  This view of the street as a shared space offers a melting pot of ideas, concepts and know-how to be carried beyond its conventional field of application, as a backbone of public space. The PIARC could promote and guarantee the efficiency of such transfers in favour of territories of all kinds. For example, the relationship of the PIARC with regard to innovation is strongly imbued with its historical road culture, its respected service culture and its growing urban culture to which the present seminar is contributing and which will be reinforced by future PIARC forums on this theme.

- The new road policies supported by European authorities, in close harmony with action of a similar nature promoted at the level of a majority of industrialised continents, are deliberately being oriented towards greener, safer, more available regulated transport systems for passengers and goods. This shows the extent to which users on the move or local residents are central to current preoccupations and are identified without question as clients whose various aspirations and requirements are to be met. As in the case of quality standards designed to meet customer specifications, and meant to be management tools based on process control, it may be considered that the control of road services by reducing disturbances to all road and street users is the new, primary issue which should mobilise the entire industrial fabric: contracting authorities, operators, engineers, industries, contractors, research centres, all increasingly disseminated and shared entities, calling for consistent and interlaced governance. Here too, the urban and interurban worlds strengthen each other by mastering the complexities specific to each.

  The PIARC could help to promote this consistent governance by initiating organisational structures and methods involving participation and partnering based on best practices in urban and rural areas. The new culture of public/private partnerships, the consequential nature of asset management recognised by all, as well as the organisations, methods and techniques available for operations on road networks carried out as "discreetly" as possible, are all aspects to which PIARC members attach great importance in their continued action to obtain the highest levels of service and performance from infrastructures expected to support directly and effectively our present and future requirements relative to travel, communications, energy and utilities essential for the social, cultural and economic advancement of populations and regions.

  The PIARC has an important and irreplaceable role in promoting and providing the means for implementing the return to unitised travel systems passing alternately from the road to the street and capable of mutual growth and expansion through the interplay of emerging issues and responses as reflected in the common sustainable development objectives embodied in PIARC's strategic vision.

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APPENDIX 1

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Seminar Programme

Seminar "Urban pavements"

PROGRAMME

21 September 2005

9.00 - 10.00 Welcome, introduction
Grzegorz Maletka, Director of the Department of Public Roads, Ministry of Infrastructure
Tadeusz Trzmiel, Deputy Mayor of the City of Cracow
Nelson Rioux, Chairman of Committee 4.3
Dariusz Sybilski, Deputy Director of the Road and Bridge Research Institute

10.00 - 11.30 *Session 1*
Urban infrastructures : who is involved, with what resources ?
President : Dariusz Sybilski

* **Hennie van der Schyff**, RPA - Upgrading of gravel roads to surfaced project in Greater Johannesburg 2002 - 2005
* **Guy Beurier**, France - Viewpoint of the Association of French local engineers in France on the technical urban governance
* **Jerzy Duda**, Poland - The history of urban roads

11.30 - 12.30 Coffee break

12.00 - 13.00 *Session 2*
Issues and specific characteristics of urban roads
President : Bystrik Bezak

* **Wieslaw Wankowicz**, Poland - Transportation problems in urban planning
* **Thomas Fessl**, Austria - Road safety in urban environments

13.00 - 14.30 Lunch

14.30 - 16.00 *Session 3*
Design of urban roads within public areas
President : Guy Beurier

* **Bystrik Bezak**, Slovakia - Sharing the urban road space
* **Jean-Pierre Christory**, France - urban infrastructure : current and future issues.
* **Marcel Smets**, Belgium - Planning

16.00 - 17.00 General debate - sessions 1 to 3
President : Marcel Smets

20.00 Banquet (Municipality of Cracow)

Seminar "Urban pavements"

PROGRAMME

22 September 2005

900 - 10.30 *Session 4*
Specific techniques and innovation
President : Jean-Michel Piau

* **Egbert Beuving**, the Netherlands - Pavement surface materials used in urban areas
* **Catherine Pankowska**, France - Surface public transportation platforms
* **Anne Beeldens**, Belgium - Urban concrete paving and photocatalytic pavement blocks : environmental friendly solutions for the futures ?

10.30 - 11.00 Coffee break

11.00 - 12.30 *Session 5*
Contribution to sustainable development
President : Yasumasa Torii

* **Martin Bürgi**, Switzerland - Road Asset Management : example of the city of Zurich Switzerland
* **Sally Ellis**, United Kingdom - Integration of tracked transport in the urban environment
* **Nagato Abe**, Japan - Eco-friendly pavements in urban areas

12.30 - 13.30 Lunch

14.30 - 16.00 *Session 6*
Road sites and operations on networks
President : Benoît Verhaeghe

* **Christine Leroy**, France - Urban pavement constraints and trench treatment
* **David Hein**, Canada - The impact of road construction and maintenance activities on roads users and the adjacent land use
* **Hervig Klinke**, Austria - Processing of urban road construction projects. The case of the city of Vienna

15.00 - 15.00 General debate - sessions 4 to 6
President : Jean-Pierre Christory

16.00 - 16.45 Synthesis, conclusions
Nelson Rioux, Dariusz Sybilski, Jean-Michel Piau, Jean-Pierre Christory, AIPCR / PIARC C 4.3

APPENDIX 2

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Overview of Evaluations

Organisation of the Seminar was driven by D. Sybilski and his co-workers from IBDiM.

Invitations were distributed among the members of C4.3 WRA and were mailed to institutions from countries of Central and Eastern Europe. Participants from these countries were thought to be the particular audience of the Seminar.

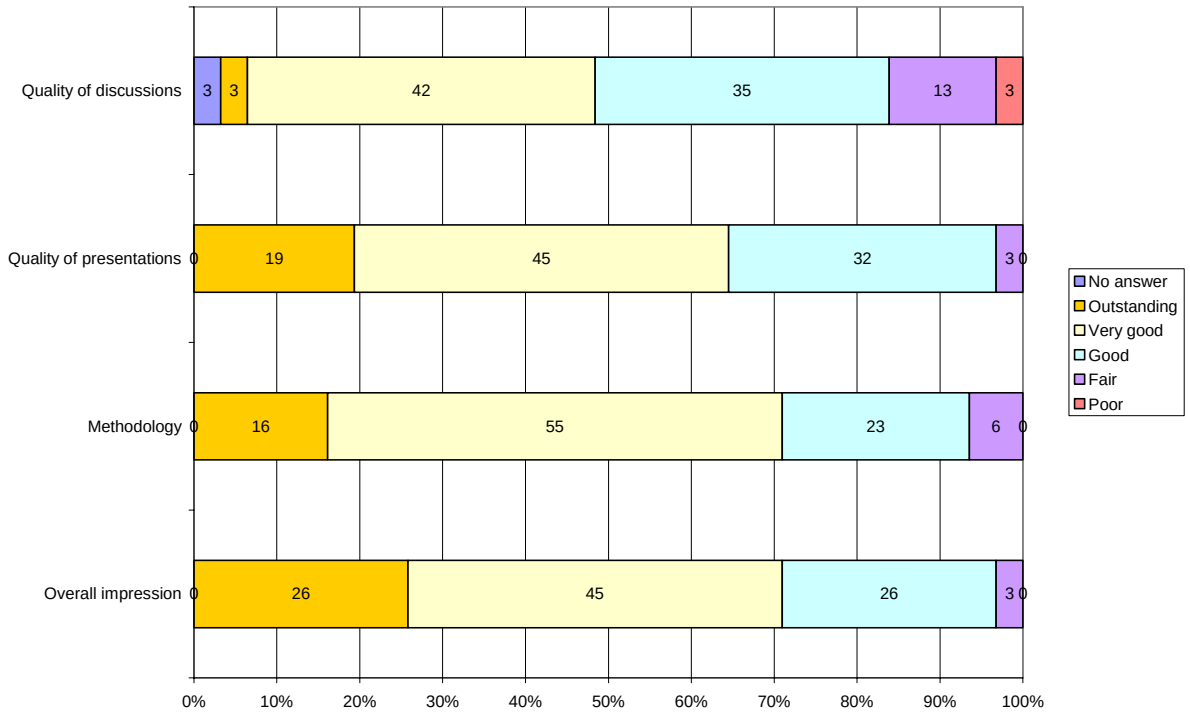
Finally, almost 200 participants from several countries (Poland, Ukraine, Czech Republic, Slovakia, Lithuania, Estonia and numerous members of C4.3).

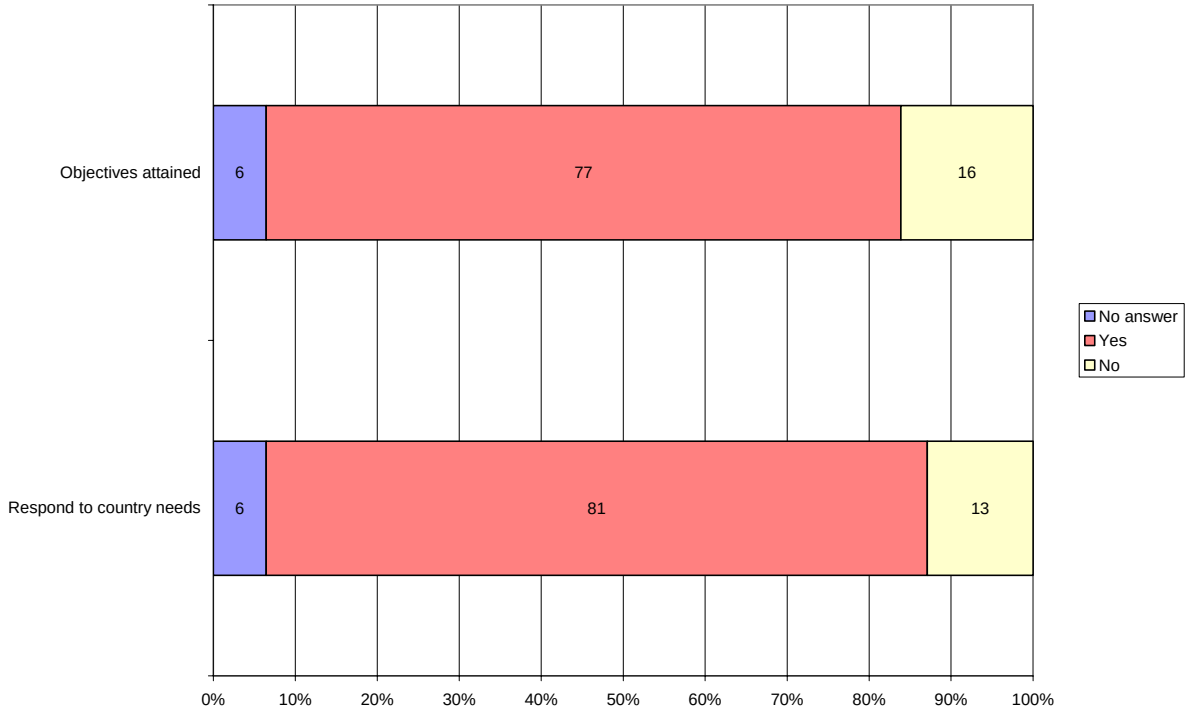
Technical content of the Seminar was prepared and directed by J.-P. Christory, France.

The evaluation form was distributed among participants. 31 answers were received. Results of evaluation are presented on Figures.

The questionnaire covered both main topics: quality of seminar preparation and presentation as well as realisation of its objectives and respond to participants' countries needs.

The overall evaluation of the quality of seminar was very positive. Majority of participants (94 to 97%) highly evaluated (from good to outstanding) the overall impression, methodology of seminar preparation and quality of presentations. Quality of discussions was evaluated slightly worse – 80% responses from good to outstanding. One of the main reasons for this lower mark was probably insufficient time for discussions, which was underlined in several responses.





As far as the evaluation of the second group of questions is concerned, majority of responses were “Yes” – participants generally confirmed that the objectives of the seminar were attained and the seminar properly responded to country needs.

It is interesting to observe that the answers for question on respond to country need were sometime completely opposite. On one hand, the responses were enthusiastic expressing novelty of technical solutions presented as well as the sorrow due to lack of funds for their implementation, on the other hand the response claimed that no innovations were presented. This is the result of variety of needs of various countries represented at his seminar – from developing, transition countries to developed countries. Response to question on country needs depended on the country development stage. In case of transition countries the needs are much more fundamental than some of the solutions presented during the seminar. In case of developed countries no new ideas presented.

APPENDIX 3

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Seminar Overview Sheet

1	PIARC Technical Committee	**C4.3 on Road Pavements**
2	Host country	**Poland**
3	Seminar title	**Urban Pavements**
4	Seminar venue	**Krakow**
5	Seminar dates	**21-22 September 2005**
6	Number of speakers from lower middle income and low income countries	**1**
7	Number of speakers from upper middle income countries	**6**
8	Number of speakers from high income countries	**12**
9	Number of participants (exclusive speakers) from lower middle income and low income countries	**13**
10	Number of participants (exclusive speakers) from upper middle income countries	**78**
11	Number of participants (exclusive speakers) from high income countries	**17**
12	Total participants	**127**
13	Total participants from host country	**77**
14	Number of lower middle income and low income countries represented	**5**
15	Number of upper middle income countries represented	**4**
16	Number of high income countries represented	**10**
17	Was a PIARC Technical Committee meeting held the same week ?	**Yes, on September 19th and 20th 2005**
18	Was the seminar held in connection with another non-PIARC event? If yes, which event and organisation?	**No**
19	Duration of the seminar, incl. Field visit. Was a field visit organised?	**Two day seminar with no visit**
20	Participants fees - (Currency)	**220 € + VAT (22%)**