

PROCEEDINGS OF THE NATIONAL WORKSHOP ON ROAD PLANNING, PAVEMENT DESIGN & OVERLOADING PREVENTION: VOLUME 1

11th - 12th November 2004

ORGANISED BY



TECHNICAL ASSISTANCE BY



NRDP
IRAP Component

SUPPORTED BY



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Broad participation of government representatives of provincial and national level, the private sector and civil society have led to the beneficial outcomes of the workshop and the organizing committee would like to congratulate all with the achieved results.

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EXECUTIVE SUMMARY

A workshop was organised on 11th and 12th November 2004 jointly by Ministry of Public Works and Transport and Ministry of Rural Development, at the Institute of Technology Cambodia, Phnom Penh. The workshop allowed presentation and discussion of the important issues relating to road planning and selection, road & bridge design, and management of vehicle loading on the Cambodian road networks. Key stakeholders from the Private and Public sector, and Military were present to contribute to the forum.

The workshop made the following Key Recommendations after group & plenary discussions:

- 1 There is a need for better **Management Information** for improved decision-making. Therefore, an updated MRD **Road Inventory** needs to be established by applying a combination of Transport Infrastructure Inventory and mapping. **IRAP planning** should be the basis for prioritisation for road rehabilitation and maintenance. The MRD road inventory should be linked to the MPW&T Location Reference Database
- 2 To study the current vehicle loading and the effect on the road, an optimum axle load¹ assessment should be carried out to determine the ideal loading conditions for the various categories of road network in Cambodia. This will help to provide informed guidance for consideration on legal regulation and appropriate levels of enforcement. **IRAP Planning** should include the recognition of roads that have a high probability of overloaded traffic (e.g. materials & log haulage).
- 3 The draft **Road Law** needs to be revised to properly tackle the issue of overloading. The law and sub-decrees related to road ownership, vehicle regulation, traffic, loading & control should be strengthened. Solutions must be identified to achieve an effective enforcement regime.
- 4 Pavement and surfacing **Designs** need to be improved and based upon road category, vehicle type, traffic, and realistic axle loading forecasts. Standards and design guidelines should be appropriate to traffic, environmental factors, loading, local materials resources and economics.
- 5 The **Quality of Road Construction** needs to be improved in accordance with design assumptions and the application of appropriate standards and materials specifications.
- 6 An effective **Maintenance Regime** needs to be established, including sustainable funding and improved management, which will eventually lead to a reduction in pavement whole life and vehicle operation costs.
- 7 **Further Consultation** is needed after the workshop, with key decision and policy makers. Discussion needs to be promoted at national and provincial level with all stakeholders in both the public and private sectors.
- 8 More **Research** is required on appropriate designs for improved pavement performance for the particular conditions experienced in Cambodia, in order to lower the construction and whole life costs, contributing towards lower transport costs & sustainable development.
- 9 **Ownership** of lower category roads; sub-tertiary should be considered for transfer to local authorities, for empowerment; to implement access control and decide traffic development, and contributions to maintenance.

¹ Optimum Axle Load is the axle loading at which Total Transport Costs to the national economy are minimised.

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A Khmer version of this Report will be available shortly.

The Report will be made available in CD and web format

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AFEO	Asian Federation of Engineering Organisations
ASEAN	Association of Southeast Asian Nations
AusAID	Australian Agency for International Aid
CFRTD	Cambodia Forum for Rural Transport Development
CNCTP	Cambodia National Community of Transport Practitioners
DFID	Department for International Development
DTW	A Mechanical Engineering NGO
EDC	Economically emerging and Developing Country
EU	European Union
FAO	Food and Agriculture Organisation
FFW	Food For Work
GTZ	German Agency for Technical Co-operation
HQ	Head Quarter
IFG	International Focus Group (for Rural Road Engineering)
IFRTD	International Forum for Rural Transport Development
ILO	International Labour Organisation
IRAP	Integrated Rural Accessibility Planning
IRD	Integrated Rural Development
JFPR	Japanese Fund for Poverty Reduction
JICA	Japanese International Co-operation Agency
KaR	Knowledge and Research
km	kilometre
Koyun	Locally assembled light truck
LB	Labour Based
LBAT	Labour-Based Appropriate Technology
LBRIRMP	Labour-Based Rural Infrastructure Rehabilitation and Maintenance Project
LCS	Low Cost Surfacing
M	metre
MEF	Ministry Economic and Finance
MPW&T	Ministry of Public Works and Transport (Cambodia)
MRD	Ministry of Rural Development (Cambodia)
NCP	National Community of Practitioners
NFG	National Focus Group (for Rural Road Engineering)
NGOs	Non-Governmental Organisations
NRDP	North-Western Rural Development Project
PDP	Provincial Development Programme
PDRD	Provincial Department of Rural Development
PIARC	World Road Association
PIP	Public Investment Programme
PLG	Partnership for Local Governance
PMU	Project Management Unit
PRDC	Provincial Rural Development Committee
PRIP	Provincial and Rural Infrastructure Project
RD&RP	Rural Development and Resettlement Project

RDS	Rural Development Structure
RGC	Royal Government of Cambodia
RIIP	Rural Infrastructure Improvement Project
RRGAP	The Rural Road Gravel Assessment Programme
RRSR	The Rural Road Surfacing Research
RRST	Rural Road Surfacing Trials
SEACAP	South East Asia Community Access Programme
SEDP I	First Five-Year Socio-Economic Development Plan, 1996-2000
SEDP II	Second Five-Year Socio-Economic Development Plan, 2001-2005
SEILA	Multilateral donors - Government Rural Infrastructure Development Programme
SIDA	Swedish International Development Agency
SWOT	Strengths, Weaknesses, Opportunities & Threats
TDSI	Transport Development Strategy Institute
TEDI	Transport Engineering Design Incorporation
TKP	Transport Knowledge Partnership
TMP	Transport Mainstreaming Partnership
ToR	Terms of Reference
TRIP	Tertiary Roads Improvement Project
TRL	Transport Research Laboratory
UK	United Kingdom
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
VDC	Village Development Committee
WB	World Bank
WFP	World Food Programme
WSP	A firm of International Management Consultants
ZOPP	German acronym for Goal Orientated Project Planning

1. INTRODUCTION - INFRASTRUCTURE PLANNING, VEHICLE OVERLOADING AND ROAD DETERIORATION



Image 1 – Truck bodies extended in Cambodia to carry at least 20m³ of construction materials on 3 axles.



Image 2 – Overloaded truck damages bridge on a secondary road.

Cambodia's road network is developing and expanding rapidly with investments in national, secondary and rural roads through a number of programmes and partner projects. The MPWT, responsible for National, Secondary National and Provincial Roads and MRD, responsible for rural roads, face challenges to plan, initiate and manage the road sector development. They are also responsible for the task of maintaining the road investments. A major factor that is currently affecting the road network is the critical issue of vehicle overloading, leading to accelerated road deterioration and severe bridge damage. There are three interrelated challenges that both Ministries face, which are to meet the identified needs for:

- An appropriate infrastructure planning tool,
- An economic strategy for road and bridge design,
- A cost-effective strategy against overloading.

Concerning the planning, the MRD has adopted IRAP (Integrated Rural Accessibility Planning) as a standard planning tool as mentioned in the Second Five Year Socio-Economic Development Plan (SEDP II). Special mention of IRAP was made by Prime Minister Hun Sen². He stated that the MRD has: "the responsibility to prepare local plans aimed at addressing the delivery and management of rural infrastructure through improved accessibility using the methodology of integrated rural accessibility planning as a survey instrument.". IRAP provides an insight regarding the location of local resources, as well as a classification and prioritisation of the road network and is currently being mainstreamed throughout Cambodia.

However there is still often a lack of sufficient information for effective decision making on a number of road infrastructure planning issues. These include:

- National inventory and categorisation of individual roads,
- Details of surface and condition of roads,
- Knowledge and database on availability of local suitable materials for road construction and maintenance,
- Traffic types and numbers,
- Axle loading data and control arrangements,
- Road Maintenance needs and arrangements,

² Closing speech at the Annual Conference at MRD, 28 February 2001

- Full expansion of planning and information systems to national coverage.

The IRAP presentations at the workshop provided a briefing to the participants on the planning processes, experiences and developments in Cambodia.

Regarding road pavement and bridge design, there are a number of issues where increased knowledge and information are required. These include:

- Design guidelines appropriate for the axle loading situation in Cambodia,
- Guidelines and standards on the design and construction of the range of alternative road surfaces that make best use of local resources, for the variety of road environments encountered in Cambodia.
- Roads that can be guaranteed to be free of heavy traffic could be constructed to lighter standards with substantial cost savings.

Concerning axle loading, there is very little information available regarding the situation on the road network in Cambodia. It is however evident that overloading is common with examples of survey weighings on main roads of over 20 ESA³ per two or three axle trucks (a legally loaded three axle truck would have a maximum axle load equivalence of 3 ESA).

Investigations under the PRIP⁴ preparation phase and the Puok Market Low Cost Surfacing Trials have since shown the overloading problem to be serious and widespread on the Cambodia road network. Truck loading of up to two and half times the legal limit has been recorded.

This level of loading, especially related to construction materials haulage and logging traffic, is well beyond the limits of research knowledge of pavement damage by vehicular traffic and established pavement deterioration relationships based on fatigue. The excessive stresses induced in most pavements and foundations by this level of overloading will cause serious problems and asset destruction on the Cambodian road network, costing the country millions of dollars. The risk of deterioration caused by overloaded vehicles will inevitably be higher for secondary and tertiary roads; these are designed and constructed with lighter duty paving if compared to heavy duty national or provincial roads.

There is now recognition of the problem of the chronic deterioration cycle and unsustainable maintenance burden of laterite surfacing in many locations, due to the particular set of conditions and circumstances experienced in Cambodia. Because of this, there are many secondary national, provincial and rural roads that are being, or going to be, upgraded or rehabilitated with light pavement structures regarding low traffic volume. But with the widespread vehicle overloading, there is a risk that those roads will be quickly destroyed or suffer considerably reduced serviceable life and significantly increased maintenance costs. This would give a strong negative image to the economic and social benefits of paved roads and may discourage further public investment in providing a sustainable surfacing to low volume sealed roads. It would also damage the credibility of the Government institutions involved.

It is clear from the Puok Trials and experience elsewhere that some types of paving are better able to resist overloading than others.

Overloading also causes serious problems to bridges and other structures. There are a number of instances of recent collapses of bridges due to overloaded vehicles. This has major economic and social, as well as asset destruction cost implications.

³ ESA : Equivalent Standard Axle (80 kN)

⁴ PRIP : Provincial and Rural Infrastructure Project

A Cambodian Road Law is currently being drafted. However, review of the latest version of the document shows that there is no recognition of the current axle loading situation and consequences for road pavement and bridge damage. There is no effective provision for rational monitoring, control, penalisation and deterrence of axle overloading.

The following conclusions are drawn from investigation to date:

- Overloading is common on all categories of road in Cambodia.
- Light or sub-standard road pavements can be quickly destroyed by overloaded trucks. Bridges are also vulnerable to serious damage and collapse by overloaded trucks.
- There is lack of assessment of what is an appropriate level of loading on each category of road to minimise the national Total Transport Costs to Cambodia.
- Pavement design processes in Cambodia do not take sufficient account of the serious axle overloading situation and Cambodia-specific conditions.
- Some types of paving are able to better resist overloading.
- The existing legal arrangements for control of vehicle loading are weak and not applied. Currently there is no effective control of overloading in Cambodia.
- Experiences from other developing countries suggest that effective axle load control is extremely difficult to achieve.
- The proposed regional axle loading regulations will **reduce** the allowable vehicle loading in Cambodia on main roads. However, they will have very little effect on the actual loading situation and road pavement damage situation in Cambodia.
- The draft proposed Cambodian Road Law does not recognise the serious axle overloading situation, or provide for an adequate framework to control axle loading.
- There may be a case for empowerment of local authorities to take responsibility for certain minor roads and control the access to them.
- Cooperation is required between the various sector stakeholders to improve the planning and management of the road network assets.

2. OBJECTIVE AND SCOPE OF THE WORKSHOP

Concerning overloading and road deterioration, an urgent need was identified for a national workshop on the related issues of infrastructure planning, axle loading and pavement design strategy. The workshop held on 11 and 12 November 2004 allowed national and international experts in this field to exchange experiences and views, to identify options for action, and the needs for further development and research. The opportunity was taken to update the participants regarding recent and planned IRAP experience and developments.

The immediate workshop objective was to inform participants of the key issues in the fields of infrastructure planning, pavement design and vehicle loading control, and to allow an open debate of these issues. The long term objective is to assist the Government of Cambodia to develop a pragmatic and economic strategy for road selection, road & bridge design, and management of vehicle loading on the Cambodian road networks. The issues related to road policy, axle load control, management and technical issues of accessibility planning, effective use of local materials resources and engineering design of the road pavement were addressed. The workshop discussed, identified and agreed the further initiatives required. This included dimensions of pavement design, traffic restrictions and vehicle/axle load control relating to road category and route purpose.

This important event brought together the road authorities (MRD, MPWT), provincial and local government, the Military, development and funding agencies, NGOs, donors,

consultants, road users, road engineers and practitioners, researchers and other key stakeholders both national and international.

The intention has been to assist MPWT and MRD to develop a future strategy for road pavement planning, design and management, to address the overloading issue, and to identify any further investigations and support required. The workshop is seen as the first important step in this vital and complex process.

3. WORKSHOP THEMES AND PRESENTATIONS

Papers and presentations were invited from experts and stakeholders to cover the following themes:

- Integrated Rural Accessibility Planning (IRAP).
- Local resource identification.
- Identification of roads susceptible to overloading.
- Cases of Overloading damaged road pavements and bridges on the Cambodian road networks in the past.
- Cost of overloading to transport infrastructure and road users.
- Experiences of overloading control on the rural Cambodian network.
- Success experiences from other developing countries in controlling axle loads.
- The current overload control management and system in Cambodia.
- Policies regarding axle loading restriction and enforcement for different road classes.
- Responsibilities for effective Monitoring and Controlling of overloaded vehicles for specific road classes.
- Measurement of traffic load and prediction of overloading.
- How to design a pavement with an overloading environment.

Appendix 4 contains the background papers and presentations made at the workshop.

4. WORKSHOP FORMAT AND PROGRAMME

The Workshop was organised as a two day event. The workshop programme is contained in **Appendix 1**.

The opening closing addresses and other speeches are contained in **Appendix 2**. The main recommendations of the working groups are presented in **Appendix 3** and summarised in the **Executive Summary** of this report. The list of workshop participants is found in **Appendix 8**.

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Ministry of Rural Development
Corner Street 169 & Russian Boulevard
Phnom Penh, Cambodia



Ministry of Public Works and Transport
Corner Norodom Boulevard & Street 106
Phnom Penh, Cambodia



Phnom Penh Office: Ministry of Rural
Development, 3rd floor, old building, Corner
Rd. # 169 & Russian Federation Blvd.

E-mails: Intech_Cambodia@online.com.kh
intech-trl@fpt.vn



NRDP – IRAP Component
ILO – IRAP/GIS Project
Ministry of Rural Development, 1st floor, new building,
Corner Rd. # 169 & Russian Federation Blvd.

Email: doekleW-ilo@online.com.kh