2.　インドネシアとの研究協力について

2. インドネシア共和国との研究協力について

2.1. 背景

インドネシア共和国との研究協力の覚書締結に至った背景には、「第 18 回アジア所長会議（平成 21 年 11 月 10 日～17 日開催、会議テーマ：地域の実情や課題に応じた独創的な道路政策)」のプレ調査として、インドネシア共和国公共事業省研究総局及び同局の 3 研究機関（道路・橋梁研究所(RDCRB)、社会経済文化地域研究所、居住研究所）を訪問し、研究ニーズ等の調査を行なったことがある。

その際、RDCRB との会合の中で、継続的な研究交流を進めるためには覚書の締結を検討すべきとの提案がなされた。それを受けて国総研は、関係部局との調整の結果、第 18 回アジア所長会議において、RDCRB 所長（Agus Bali Silendra 氏）をお招きし、研究協力の覚書締結に至ったものである。

次ページ以降に、覚書締結について及び共同ワークショップ開催について、並びに共同ワークショップ終了後に行なったアンケート調査の結果についてとりまとめを行なったので報告する。

覚書締結の準備にあたり、国総研はインドネシア共和国を訪問している。下記に訪問に関する目的及び会合内容についての詳細を記載する。(海外出張調書)

海外出張調書

出 張 者 ：国際研究推進室長　寺元博昭
出 張 件 名 ：国際研究連携推進のための専門家会合
出 張 先 ：インドネシア国　ジャカルタ市、バンドン市
出 張 期 間 ：平成２１年６月１日～平成２１年６月５日（５日間）

出張の目的：本出張の目的は、インドネシア国公共事業省研究開発総局 Agency for Research and Development, Ministry of Public Works、同道路総局 Directorate of Highways, MPW、同社会経済文化地域役割研究所 R&D Center for Social Economic, Cultural and Community Role, ARD, MPW、同道路橋梁研究所 R&D Center for Road and Bridges, ARD, MPW の研究担当幹部及び実務担当専門家と、両国における国土整備関係の研究に関する現状と課題を共有するとともに、共同研究テーマの発掘に向けた研究ニーズを明らかにすること、研究協力と支援の意志を伝えること、より具体的な国際研究の推進に向けた人的つながりや足がかりを作ることである。

（当日の発表と質疑等）

会合では、国総研が取り組むプロジェクト研究の状況や研究の枠組み（大枠による PDCA）等をプレゼンする一方、インドネシア国からは、研究体制（予算、人員、研究評価、本省と研究所との関係等）について紹介いただいたのち、関連事項等を質疑し、国際研究協力の推進に向けた認識の共有を図った。

今回、研究開発総局長（研究開発庁トップ）の勧めで、当初の行程には入れていなかった居住研究所も訪問した。また本会合に合わせて PPP 手法による Tanjun Priok Access Road の現地視察を行った。個別には下記の通りである。

（１）研究開発総局との会合（会合の様子　写真-1、2）

対応相手：研究開発総局長（研究開発庁トップ）、社会経済文化地域役割研究所長、道路・橋梁研究所国際担当官ほか

- Ir. Hendrianto Notosoegondo, Director General, ARD, MPW 公共事業省研究開発総局長
- Drs. Pradino, Director, R&D Center for Social Economic, Cultural and Community Role, ARD, MPW　社会経済文化地域役割研究所長　他

・本会合は公共事業省研究開発総局会議室で実施された、各研究所との会合に先立つ全体会議である。

・研究体制；公共事業省の研究体制は、全体の方針、予算付け等を研究開発総局が総括し

ているが、実質的な研究は４つの研究所で担っているとのことである。技術的な規制は個々の州が行っていて、研究開発総局は SGM（Standard, Guideline, Manual）を通して技術指導を行っている。また州では技術開発も困難であり国が行っている。

・予算と人員；H21 年度研究予算は 300billion ルピア（約 30 億円）であり、国総研予算の３分の１程度の規模。人員は研究官が 200 名、行政官が 500 名で計、700 名。国総研は研究官が 252 名、行政官が 119 名であり、これに比して、研究補助を外注するわけではないので行政官が多くなっているとのことである。

・会合の結果、JICA プロジェクトの伸びが期待できない中、研究領域での協力関係の構築、課題、人的交流の重要性について、認識を共有できた。

・研究総局のトップである総局長と情報交換、認識の共有を得られたことは大きな成果（現在の総局長ヘンドリアント氏は、道路総局長を長年務めた人物で、大臣に昇格（公共事業大臣は、伝統的に、５つある総局長の中から選ばれたテクノクラートが努めている）する可能性もある大物）である。

・人的交流の促進；当方が研究所の窓口（AccessPoint）として調整するので、日本学術振興会（Japan Society for the Promotion of Science(JSPS)）等の制度を利用して、積極的に研究者の派遣をいただきたい旨を伝えた。

・技術的な課題；基準作成に関しては、インドネシアは大きな多様性の中にある国であるので、力学的な共通基盤以外は、地域の特性（構築物の形状や素材など）について極力反映させようとしていること、日本が取り組む柔軟な道路構造基準に大きな興味があるとのことであった。本年のアジア地域研究所長など会議のテーマでもこの規範性と柔軟性を両立させる基準のあり方等についてテーマに入れていること等を伝えた。

写真-1

写真-2

※ 写真-1：研究開発総局との会合、筆者右側、奥に研究開発総局長

※ 写真-2：研究開発総局長 Hendrianto 氏と寺元国際研究推進室長

（２）道路総局との会合

対応相手：道路総局長、道路技術課長、道路ファイナンス担当課長

- Dr. Ir. A. Hermanto, Director General, DGH, MPW 公共事業省道路総局長
- Ir. Danis H. Sumadilaga, Director of Technical Affairs, DGH, MPW 公共事業省道路

総局技術課長
- Ir. Nur Fizili Kifli, MT. Financial Affairs, DGH, MPW 公共事業省道路総局総務財政担当　他
・本会合は道路行政関係の研究プライオリティについて、道路総局長、技術課長ほかと議論したものである。
・その結果、アセットマネジメント、Toll･Road、調達契約関係に優先度を高くおいて行きたい旨、先方のニーズを把握できた。
・アセットマネジメントについては概念がわかりにくいので困っていること
・Toll･Road については、約 700km の運用状況であるが、日本の取り組み、特にプール制の仕組み（先行した路線の益を後発に回したいという意向を持っているとのこと）や料金と交通管理の関係について日本の先進事例を学びたいとのことであった。日本の民営化のスキームと平日・休日料金社会実験の状況等について概要も説明し、今後とも喜んで協力する旨伝えた。
・調達契約については、インドネシアと日本とで商習慣が異なるので比較は難しいが技術と経営の両面から関連企業を評価する日本の取り組み等を紹介できる旨伝えた。
・研究総局長、道路総局長以下、大変歓迎いただいた。本会合の結果、研究領域でのネットワークを先方も望んでいることがわかった。

（３）社会経済文化地域役割研究所との会合（写真-3、4）
対応相手：社会経済文化地域役割研究所長、国際担当窓口課長ほか
- Drs. Pradino, Director, R&D Center for Social Economic, Cultural and Community Role, ARD, MPW　社会経済文化地域役割研究所長　他
・本研究所は設立から９年しかたっておらず４つの研究所ではもっとも新しい組織で、日本にはストレートに対応できる研究センターはない。
・名称や役割については日本の組織としても時代の先を行っている感じがしてとても挑戦的ですばらしい。
・研究ニーズとしては、用地の円滑な取得に向けた仕組みやプロジェクトの経済的、社会的影響の把握、事業への住民の参加（Involve）やインフラ施設の地域への多様性を踏まえた定着、地球環境関係では植林などに地域とともに積極的に取り組んでいる。
・会合の結果、Public Acceptance 関係の研究というくくりで国総研の活動との接点があると思われる。また、以下の認識を共有した。
〇Public Acceptance を得るためにプロジェクトの社会的、経済的インパクトを調査する必要があること
〇それらをプロジェクトの前後で行うこと
〇Negative な情報や影響も公開することで透明性を確保し、バランスの取れた、信頼性の高い合意が得られること
〇関係者のコミュニケーション能力を高めることが重要であること
〇インドネシアと日本とは社会の多様性のレベルが異なるが、法的な手続き等は比較し、応用できる部分もあると考えられること

・直接対応した組織は日本にはないが、まず当方にアクセスしてもらえれば適宜、適切なセクターにつないでいくことや、研究者の交流に必要な調整も積極的に行っていきたい旨伝えた

写真-3

写真-4

※　写真-3：社会経済文化地域役割研究所での会合
　　奥左が Pradino 所長、奥右が寺元国際研究推進室長

※　写真-4：Pradino 所長と寺元国際研究推進室長

（４）道路・橋梁研究所との会合（写真-5、6）

対応相手：道路・橋梁研究所長、国際課長ほか

- Ir. Agus Bari Sailendra, Director, R&D Center for Road and Bridges, ARD, MPW　道路・橋梁研究所長

- Ir. GW SAMSI GUNARTA, Chief of Division, Programming & International Collaboration, R&D Center for Road and Bridges, ARD, MPW　道路・橋梁研究所,計画・国際担当課長　他

- Dra. IPAH SARIPAH, MA, Head of Sub Division of Cooperation Depertment, R&D Center for Road and Bridges, ARD, MPW　道路・橋梁研究所、協力部副課・課長　他

・本会合は、研究開発総局との全体会議を受けた、道路関係の研究所との研究協力に関する会合である。

・先方より研究テーマについて紹介いただき、道路総局と同様、アセットマネジメント関係に大きな関心があることがわかった。

・また先方より、是非、MOU（研究協力に関する総括的な覚書）を結んで研究力を進めていきたい旨、提案があった。当方より、これまでインドネシアと日本とは JICA を通したやや一方的な関係であったが、インドネシアの整備状況も進んできており、今後は更に一方進んだ関係になっていくべき旨を伝え、先方研究所長より、同様の認識を持っていること、人的な交流が重要であるとの発言があった。

・本日の会合を契機として、国際担当を窓口に、更に具体に研究協力について検討していくことを確認した。

写真-5

写真-6

※ 写真-5：道路・橋梁研究所での会合、奥左が Agus 所長、奥右が寺元国際研究推進室長

※ 写真-6：Agus 所長と寺元国際研究推進室長（記念の公共事業省モニュメントを贈呈いただいた）

（参考）居住研究所の視察

対応相手：居住研究所所長ほか

- Dr. Ir. ANITA FIRMANTI, MT, Director, R&D Center for Settlement, ARD, MPW 居住研究所長ほか

・研究開発総局との会合において、多様性と研究開発との調和などの議論の中で、総局長のヘンドリアント氏より、是非、居住研究所も視察いただきたい旨の話があり、急遽、同研究所を視察し、実験施設や研究方針などの説明を受けた。

・研究開発総局の下部組織であるが、他の研究所同様、本省の担当局との一体的な活動を行っていること、具体には空間総局の領域の研究も行っている。

（５）Tanjun Priok Access Road の現地視察（写真-7、8、9、10）

ジャカルタの環状道路の整備をＰＰＰで進める上記のプロジェクトを視察した。インドネシアは 1978 年に最初の有料道路が整備され、現在約 700ｋｍの高速道路をもつが、採算の問題等から、本プロジェクトは初めて、ヨウカン切りで公共事業が一部入っていること、またその区間も含めて管理をコンセッションで行うことなどが特徴的である。

労務単価は、日本円で１日約 100 円程度とのこと。ちなみに中央省庁課長は月額約２万円（ただし、種々の手当等で２倍程度になるとのこと）。視察の最中に写真のとおり、後方の確認不足で場内の看板が大破（写真-7、8）。インドネシアの工程管理、安全面などの難しさを目の当たりにした。

ジャワ島は、いわゆるラダー構造で高速ネットを計画しており、開発の進む北側海岸（日本で云えば、太平洋側？）の高速道路整備を進めたいとの意向で、そのためにもプール制のような先発の高速の益を吸収するファンドを立ち上げたいとのことであった（財務当局と公共事業省の間での綱引きがあるとのこと）。

写真-7

写真-8

写真-9

写真-10

TANJUNG PRIOK ACCESS ROAD

The Tanjung Priok Access Road (**TgPA**) will provide direct access to/from the Tanjung Priok International Port which is 24th ranking of container handling volume in the world. It is a part of JABODETABEK toll road network connected to JORR (Jakarta Outer Ring Road) and its radial toll roads.

(TgPA and Toll Road Network in JABODETABEK)

TgPA is going to be constructed along the existing arterial roads (i.e. Jl. Cakung-Cilincing-Jl. Jampea, Jl. Laks RE Martadinata, Jl. Yos Sudarso) which are sole existing access roads of the Tanjung Priok International Port to/from eastern, western and southern region. Currently serious traffic jam is frequently observed due to massive traffic demand and obstructing logistic activities of the port.

(Traffic Jam along Jl. Jampea)

FUNCTION OF TgPA

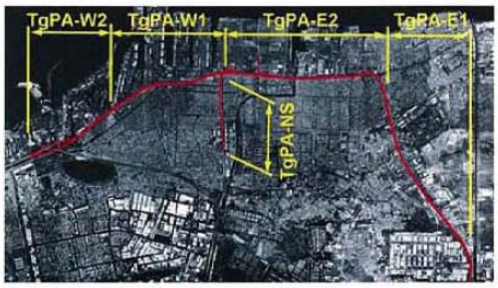
TgPA is expected to contribute the following essential functions.

- to avoid serious traffic congestion, thereby contributing to sustainable urban activities;
- to supplement the function of radial toll roads, and the Cengkareng Access;
- to enhance physical distribution originating from Tanjung Priok International Port; and
- to support land use improvement in the JABOTABEK area.

CONTRACT PACKAGE OF TgPA

TgPA consist of 5 sections.

E-1	**Rorotan - Cilincing (3.4 km)**
E-2	Cilincing - Jampea (4.2 km)
W-1	Jampea - Kampung Bahari (2.8 km)
W-2	Kampung Bahari - Harbor Toll Road (2.9 km)
NS	Jampea – Kubong Bawang (1.7 km)



(Contract Package of TgPA)

THE PROJECT SECTION E-1 : ROROTAN - CILINCING

Section E-1 is the first section to start the construction.

Location	: Rorotan - Cilincing
Length	: 3.4 km At-grade Section (Pile Slab Structure) : 2.1 km Elevated Section (2 nos of flyovers) : 1.3 km
Cross Section	: 6 lanes (3.5 m @ 6 lanes) carriageway Outer Shoulder Width : 2.5 m Inner Shoulder Width : 0.5 m
Interchanges	: Half Diamond Type IC (Semper IC)

写真-11

※ 写真-7：Tanjun Priok Access Road の工事（群杭の施工）の状況

※ 写真-8：視察中に場内の移動で看板を大破の様子

※ 写真-9：土質はラテライト

※ 写真-10：作業員８人ごと１人（黄色のヘルメット）の世話役

国内では考えられないが写真左側の崩れを木柱のみで仮止め

※ 写真-11：Tanjun Priok Access Road　プロジェクト全体概要

※ 道路交通関係データ（会合での聞き取り等）

①Toll･Road の延長

・Operation 688km(内、Jasa Marga 529km、Private Sector 158km)

・Concession Agreement Signed　802km

・Concession Agreement Preparation 169km

・Tender Preparation 475km

②Toll･Road の料金　５円～７円/km 程度

③Toll･Road の建設コスト

850Rp.B(10 億円/km 程度)

④自動車保有台数　約 750 万台

内、半数がジャカルタでの保有、この他にバイク約 2,500 万台

⑤交通事故死者数　１２千人、２４千人、３６千人の３つの数字

（２４千名は保険会社のクレームデータであり３６千人が実際？）

（その他）

今回、ジャカルタ市から研究所のあるバンドン市まで、大使館に車の手配の便宜供与を受けることができたのは幸いであった。この間の高速道路は 2005 年に約１年の突貫工事で行ったとのことで、まだ５年弱しか経過していないにもかかわらず、舗装の状態は極めて悪く、日本で云えば、舗装の悪い県道を 120ｋｍ程度で走行するような感じであった。雨期にもかかわらず工事を強行したため、各所で Slide が発生したとのことであった。橋梁横断部も衝撃が激しく、踏みかけ板が入っていない？場合もあるようであった。

またジャカルタ市内の道路交通状況で特徴的なのは、多くの交差点が右折禁止になっていることがある。ただ、左折してＵターンしている車も見られたので、右折車線をつくるなどのオーソドックスな対策の方が無用の台キロの発生を抑制できるようにも感じた。交通マナーはまだまだであり、Hard-Shoulder（路肩）を平気で走行している、というより、１車線と認識しているに近く、ジャカルタ・バンドン間の 140km の間に、３台も路肩から転倒している車がいたのには驚いた。ジャカルタ市内も同様。当方が赴任経験のあるイングランド(英国道路庁 HA)では Active Management と称して、渋滞時に正式に Hard-Shoulder を通行させているが、こちらの場合は違法。

事前に英字新聞の記事で、Jockey という職業？が発生しているとの記事を読んでいたので、注意深く、車中から見ていると、赤ちゃんを抱いた母親らしき人が２本の指を立てて、ヒッチハイクのような仕草をしているのを発見した。道路・橋梁研究所で聞くとやはり、それは Jockey とのことで、ビジネスタイムに市内に入る車両は３人載らなければ追加料金となるとのことであった。

以上、現地でないと発見できないこと、感じ取れないことも含め、今回の会合は極めて有意義であった。研究開発総局長、道路総局長、各研究所長とも直接情報交換できたことや、彼ら関係者が新たな関係つくりに前向きなことを確認できたことは今後の国際研究の推進にとって大きな成果となった。今回、予想を大きく上回る対応をしていただけたのは、対等な立場で協力関係を作り上げていきたいという、こちらからの提案が今回初めてのことであったこととも無縁ではないと思われる。支援する側、される側を超えた関係づくりこそ、アジア各国との間で進められるべきとの感を強くした。

（以下、当日資料の抜粋）

Mission of This Meeting;

1. About us;
NILIM - National Institute of land and Infrastructure Management, a technical branch of the Ministry of Land, Infrastructure, Transport and Tourism in Japan

2. Mission of this meeting;
   1) Pre-research for the 18th Asian Conference of Public Works Research and Development - Roads and Vital regions (draft theme), which will be held in Japan this autumn under the collaboration between Japan International and Corporation Agency(JICA) and NILIM, in order to be as fruitful as possible.
   2) Find out the actual needs for the roads of Indonesia in the scope of international research cooperation between Japan and Indonesia.

3. When the needs for research cooperation in respect of the roads are identified, we will try to consider the possibility of the research cooperation and technical information exchanges between the related research organization in Indonesia and us.

(Meeting contents)
   i) Presentation from NILIM (Research scheme, Budget, Evaluation system….)
   ii) Answer/Presentation from Indonesia
   iii) Questions & Discussions

(AppendixⅠ) Questionnaire for Research and Development Agency, Director General of Highway, Research and Develop Center for Roads and Bridge, and Socio-Economic-Culture & Public's Center　（中略）

(AppendixⅡ) Questionnaire for Director General of Highway, Research and Develop Center for Roads and Bridge, regarding to the Priority of co-research between NILIM and Related Research Centre in INDONESIA　（中略）

Contents of This Meeting;

1. Presentation from Japanese side (NILIM) (about 20 minutes)

- Mission, Budget, Human-resources, Organization in NILIM
- Strategic Project Research and Evaluation-system in NILIM
- International Research Cooperation in NILIM

2. Presentation from Indonesia /Answer to the Questionnaire

- Answer referencing to Appendix Ⅰ and/or Appendix Ⅱ
- Others

3. Question and Discussion

ADDRESS

Directorate General of Highways
Jl. Pattimura No. 20
Kebayoran Baru
South Jakarta 12110、Tel: +62 21 7279 7849
Agency for Research and Development
Jl. Pattimura No. 20
Kebayoran Baru
South Jakarta 12110、Tel: +62 21 724 5083
Research and Development Center for Social Culture, Economic, and Community Participation
Jl. Sapta Taruna Raya No.26
Ministry of Public Works Complex
Pasar Minggu
South Jakarta 12310、Tel: +62 21 751 1081
Research and Development Center for Road and Bridges
Jl. A.H. Nasution No. 264
Bandung 40294
West Java、Tel: +62 22 780 2251
Research Institute for Human Settlments
Jln. Panyaungan Cileunyi Wetan Kab.
Bandung 40393
West Java、Tel: +62 22 779 8393

Mission of This Meeting;

1.About us;

NILIM - National Institute of land and Infrastructure Management, a technical branch of the Ministry of Land, Infrastructure, Transport and Tourism in Japan

2.Mission of this meeting;

1) Pre-research for the 18th Asian Conference of Public Works Research and Development – Roads and Vital regions (draft theme), which will be held in Japan this autumn under the collaboration between Japan International and Corporation Agency(JICA) and NILIM, in order to be as fruitful as possible.
2) Find out the actual needs for the roads of Indonesia in the scope of international research cooperation between Japan and Indonesia.

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(Meeting contents)

i) Presentation from NILIM (Research scheme, Budget, Evaluation system….)
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(Appendix Ⅰ) Questionnaire for Research and Development Agency, Director General of Highway, Research and Develop Center for Roads and Bridge, and Socio-Economic-Culture & Public's Center

(Appendix Ⅱ) Questionnaire for Director General of Highway, Research and Develop Center for Roads and Bridge, regarding to the Priority of co-research between NILIM and Related Research Centre in INDONESIA

Contents of This Meeting;

1. Presentation from Japanese side (NILIM) (about 20 minutes)

・Mission, Budget, Human-resources, Organization in NILIM
・Strategic Project Research and Evaluation-system in NILIM
・International Research Cooperation in NILIM

2. Presentation from Indonesia /Answer to the Questionnaire

・Answer referencing to Appendix Ⅰ and/or Appendix Ⅱ
・Others

3. Question and Discussion

＜Appendix Ⅰ＞

Questionnaire

Objective of this pre-research for “the meeting”;

The objective of this study is to collect the information on the research management of the related research institutes in INDONESIA , with a view to clarifying the overall research direction of the institute, the grand challenge of the research project to which the institute as a whole address, and the individual research themes as to how they manage, plan, implement them and how they publish the results. This survey is consisted of the following:

1. Organization, staffing, and funding of the research institute
2. Research management system
3. Individual research management cases
   (research needs, Plan-Do-See-Check cycle, result…)

1. Organization, staffing, and funding of the research institute

Ⅰ. Staffing and employment

- Please describe the procedures for staff employment.
- Please indicate whether or not there is staff exchange with Universities and other research institutes.

Ⅱ. Management and allocation of research budget and its criteria

- Please describe the procedures and criteria for allocating research budget to each research unit, research theme, or researcher.
- Please explain how the allocated budget is used (proportion of labor cost, in-house facility improvement cost, and outsourcing cost, etc.).

Ⅲ. Establishment and dissolution of the research unit (laboratory, team...)

- Please indicate whether establishment of the research unit comes first and then the research follows, or the research theme comes first and then establishment (and eventual dissolution) of the research unit follows.

Ⅳ. Performance assessment of researchers

- Please indicate whether or not performance assessment of researchers is implemented.

- If implemented, please describe the criteria and weighting factor of the assessment.

2. Research management system

Ⅰ. Determination of the overall research policy

- Please describe the procedures to determine the overall research policy of the institute and whether or not there is any involvement of an advisory committee or alike.
- Please describe the procedures to prepare a strategic plan etc. which explains the overall research policy.

Ⅱ. Determination of the research themes (i.e. planning method)

- Please describe the procedures to identify research needs and to determine research themes; for instance, whether or not researchers opinions and/or requests from superior institutes are taken into consideration, or if the public is consulted.

Ⅲ. Methods to evaluate and publicize the research results

- Please describe the procedures to evaluate the research results.
- Please describe the procedures to publicize and disseminate the research results.
- Please indicate how much effect is gained by the publication and whether or not assessment of such effect is implemented.

3. Individual research management cases

Ⅰ. Flow of procedures of an actual research project

- By way of example, please describe an actual research project along the course from planning to research reporting.

Reference materials related to above matters would be appreciated. If possible, please give a description of the system with its advantages and disadvantages, current issues and so on.

＜Appendix Ⅱ＞

Questionnaire

Objective of this sheet for “the meeting”;

The objective of this sheet is to collect the information on the priority for co-research needs in the area of roads and related administrations in INDONESIA.

With a view to clarifying the overall research needs, it should be delivered to try to research the possibility of co-research between NILIM and the related Research Centre in INDONESIA gov. , for example ,at the opportunity of the 18th Asian Conference for Public works research and development which will be held in JAPAN this autumn under the cooperation between NILIM and JICA.

Which sort of needs bellows do you have a highest priority in the area of roads and related administrations in your country?

Q1. Please check top-three priorities;

(1) Actual New Public Management for roads administrations
(2) New services in the field of toll roads and traffic information
(3) Cost-reduction methods in roads construction and related procurement
(4) Global warning challenge in roads and networks
(5) Roads Planning to improve the town amenity
(6) Asset management technology for roads
(7) Flexible technical standards for best roads in each region
(8) Prevention and mitigation for natural disasters in roads
(9) Others

Q2. Why did you select them for the top-three priorities in Q1 ?

Reasons;

（ ）

2.2. 研究協力の覚書締結について

RDCRB との覚書の締結は第 18 回アジア所長会議開催時に行なった。本会議には RDCRB 所長の Agus Bali SAILENDRA 氏が参加して、西川所長とともに覚書に調印を行なった。

覚書の記者発表資料及びの全文を掲載する。

2.2.1. 覚書締結の内容について（記者発表資料）

国土技術政策総合研究所とインドネシア国公共事業省道路・橋梁研究所の研究協力に関する覚書の締結について

国土交通省国土技術政策総合研究所（以下、NILIM という。）は、11 月 10 日から 13 日にかけて開催した「第 18 回アジア地域国土整備関係研究所長等会議」において、インドネシア国公共事業省道路・橋梁研究所(Research and Development Center for Roads and Bridges, Research and Development Agency, Ministry of Public Works, Indonesia)（以下、RDCRB という。）との研究協力に関する覚書を締結しました。

＜覚書締結の概要＞

締結日：平成 21 年 11 月 11 日（水）

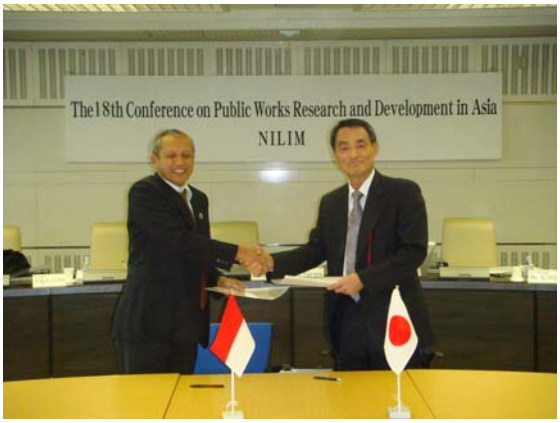
場　所：国土交通省国土技術政策総合研究所

署名者：国土交通省国土技術政策総合研究所

所長　　西川　和廣

公共事業省道路・橋梁研究所

所長　　Agus Bari SAILENDRA



覚書締結式の写真

＜研究協力の目的＞

（１）RDCRB と NILIM の研究協力関係の促進及び保持

（２）道路の制度システム、建設、維持運営の分野における情報交換の実施及び促進

＜交流活動の実施＞

（１）会議、出版物等を通じた技術情報の交換

（２）RDCRB と NILIM の職員の可能な範囲での研修交流等

＜本覚書の意義と今後の展開について＞

近年、アジア各国においては、効率的な物流の確立、都市における道路建設と環境の調和が必要とされています。また、道路や橋梁の建設及び維持管理に関する新たな取り組みも進みつつあり、このような諸システムについての最近の状況について国際的に情報交換を行うことは大変有益なことです。

そこで RDCRB と NILIM は、「第 18 回アジア地域国土整備関係研究所長等会議」においてこれらの課題について幅広く議論を行い、今後の相互利益のために引き続き討議し緊密な関係を保つことで一致したものです。

今後は、本覚書の締結に基づき、当所とアジア地域との連携強化や国際的な人的ネットワーク形成の観点から、共同で技術セミナーを開催するなど両研究所の継続的な研究情報の交換や研究者の交流等を積極的に行い、アジア地域の成長を技術面からサポートしていく予定です。

2.2.2.　覚書（サイン入り）

Memorandum
Concerning the Cooperation Activities

Between

Research and Development Center for Roads and Bridges, Research and Development Agency, Ministry of Public Works, Indonesia

And

National Institute of Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism, Japan

Road networks are indispensable to the national economies and the wealthy life of the people. Currently, in each country of Asia, the establishment of the efficient physical distribution and the harmonization between road investment and environment in the city are needed, and in addition, new schemes for construction and maintenance of roads and bridges are being introduced, so that it is very beneficial to exchange the current knowledge of such systems internationally.

Research and Development Center for Roads and Bridges, Ministry of public Works, Indonesia (hereinafter referred to as "RDCRB") and National Institute of Land and Infrastructure Management, Ministry of land, Infrastructure, Transport and Tourism, Japan (hereinafter referred to as "NILIM") have discussed a wide range of these roads issues at the 18th Conference on Public Works Research and Development in Asia and decided as follows to have further talks and contacts for mutual benefits.

1. Objective of the cooperation activities:

(1) To promote and maintain close relationship between RDCRB and NILIM; and

(2) To carry out and facilitate exchange of information in the field of road institutional system, construction, operations and maintenance.

2. Exchange activities:

Exchange activities will be carried out by a number of means, including

(1) Exchange of technical information through meetings, publications etc; and

(2) Exchange of trainees from among the staff members of RDCRB and NILIM according to availability.

3. Methods of implementation:

Most appropriate methods for implementing the above activities will be developed as decided between RDCRB and NILIM and will be carried out in accordance with their respective national laws and regulations.

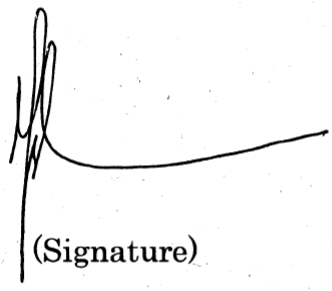
The cooperation under this Memorandom may be modified by mutual consent, and may be terminated at any time by either side with a simple

written notice to the other side.

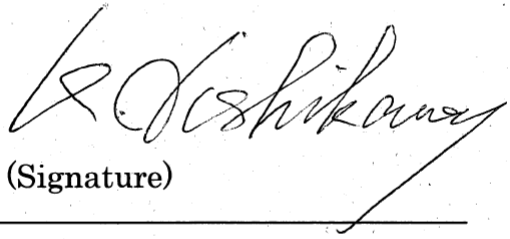
4. Contact points:

The contact points for the implementation of this Memorandum will be the Programming and Institutional Collaboration Division of RDCRB, and the International Research Division of NILIM.

Sighed in TSUKUBA on November 11, 2009 by



(Signature)



(Signature)

Agus Bari Sailendra	Kazuhiro Nishikawa
Director Research and Development Center for roads and Bridges, Research and Development Agency, Ministry of Public Works, Indonesia	Director general National Institute of Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism, Japan

2.3. 第１回ワークショップの開催について

第１回共同ワークショップは平成 22 年 3 月 1 日～3 日まで RDCRB 所内（バンドン市内）において開催された。

2.3.1. プログラム

JOINT WORKSHOP (IRE and NILIM&PWRI) AGENDA
Bandung-Indonesia, February 28 to March 4, 2010

01 March 2010

09.00 – 12.00	Courtesy Call to DG of The Agency for Research and Development and DG of Highways. RSVP: Mulya (+62 818 135 1390)
16.00	Arrive at Hotel Novotel, Jl. Cihampelas Bandung
19.00 – 21.00	Dinner with Head of RDCRB (IRE) and selected Staff (Hosted by IRE); Location: Sindang Reret Restaurant, Jalan Surapati 35 Bandung; RSVP: Hindun Hasanah (+62 817 929 0002)

02 March 2010 Roads and Bridges Workshop

Opening Ceremony

08.30 – 09.00	Registration
09.00 – 09.15	Welcoming Address by DG The Agency for Research and Development MPW (DR. Ir. Moch. Amron,MSc)
09.15 – 09.30	Opening Speech by Vice Ministry of Public Works (DR. Ir. Hermanto Dardak, MSc)
09.30 – 09.45	Message from DG of NILIM on behalf of Japanese side
09.45 – 09.50	Souvenier Exchanges between -IRE and NILIM -IRE and PWRI

Presentation (General Session)

09.50 – 10.05	Research Strategy of NILIM and PWRI including International Collaboration for Infrastructure Policy and Technology in Asia (Mr. Akira TERAKAWA, Executive Director of NILIM)
10.05 – 10.20	The Direction of Highways and Transportation Research of Indonesia (Ir. Agus Bari Sailendra, M. Sc, Director of IRE)
10.20 – 10.30	Q&A Discussions

10.30 – 10.45 Coffee Break

Presentation	**(Technical Session)**
Section I	**Pavement (Room A);**
Moderator:	**DR. Ir. Sjahdanulirwan, M. Sc-IRE**
10.45 – 11.05	Pavement Strategy in Japan(Mr. Kubo, MSc – PWRI)
11.05 – 11.25	Indonesian Pavement Research Strategy (DR. Ir. Furqon Affandi, M. Sc-IRE)
11.25 – 11.45	Pavement Condition on Post Disaster (Ir. Nyoman Suaryana, M. Sc-IRE)
11.45 – 12.05	Utilisation of Buton Natural Asphalt, Problem and Solution (Ir. Nono Sunaryono, M. EngSc / Ir. Kurniadjie, M.Sc-IRE)
Section II	**Disaster and Bridges (Room E);**
Moderator:	**DR. Ir. Maulidya I Junica, M. Sc-IRE**
Presentation	
10.45 – 11.05	Prioritization of Bridge – Works in Network (Mr. Nakao,MSc – NILIM)
11.05 – 11.25	Seismic Design and Seismic Retrofit for Highway Bridges in Japan (Dr. Zhang -PWRI)
11.25 – 11.45	Report on Bridges Infrastructure Investigation on Post Disaster (Nandang Syamsudin-IRE)
11.45 – 12.05	The Need and Development for Bridges Srengthening Technology in Indonesia (Redrik Irawan-IRE)
Section III	**Traffic and Technology (Room C);**
Moderator:	**DR. Ir. Hikmat Iskandar, M. Sc**
Presentation	
10.45 – 11.05	Local ITS Strategy (Mr. Hamada, M. Sc – NILIM)
11.05 – 11.25	Maintenance System of Toll-roads including against Overload (Dr. Konishi)
11.25 – 11.45	Strategy on ITS Development in Indonesia (Ir. Pantja Dharma Oetojo, M. Appl. Sc-IRE)
11.45 – 12.05	The Policy and Evaluation of Electronic Toll Collection System Application in Indonesia (DR. Ir. Rudy Hermawan Karsaman, M. Sc-Indonesia Tollroad Authority; ITA)
12.05 – 13.00	**Lunch Break**

Discussion

13.00 – 15.30	Section I/Pavement (Room A) Section II/Bridges (Room E) Section III/Traffic (Room C)
15.30 – 15.45	**Coffee Break**

Plenary

15.45 – 16.00	**Conclusion and Recommendation (Room A)**
Moderator	Ir. IGW Samsi Gunarta, M.Appl. Sc, Head of Division / Program and Cooperation-IRE Mr. Hiroaki Teramoto, M Sc, Divisional Director / International Affairs and Promotion-NILIM
16.00 – 16.15	Closing by Ir. Agus bari Silendra, Director of RDCRB (IRE).
19.00 –	Dinner hosted by NILIM/PWRI at the Valley Restaurant, Jalan Pakar Timur no 28, Dago-pakar, attended by NILIM-PWRI delegations, VIP of ARD, IRE/ITA presents, moderators, and contact person for Research Collaboration (estimated 17 people)

03 March 2010 Wrap Up Meeting and Program Development

09.00 – 11.00	Meeting on Joint Research Program Development; the program will be compiled on the basis of workshops recommendation (Pavement/Bridge/Traffic&Technology)

(Members of Japan side)

Mr.Terakawa,MSc
(Executive Director for research affairs, No2 of Civil Engineering of NILIM)

Mr.Teramoto,MSc
(Divisional Director of International Affairs and Promotion,NILIM)

Mr.Matsushita
(Researcher of Evaluation Division,NILIM)

Mr.Hamada,MSc
(Research Coodinater of Advanced Information Technology,NILIM)

Mr.Nakao,MSc
(Seneir Researcher of Earthquake prevention Divission,NILIM)

Dr.Zhang
(Rsearcher of Bridge and Structure Technology Research Group,PWRI)

Mr.Kubo,MSc
(Leader of Pavement Team,PWRI)

Dr.Konishi
(Head of Technology and Development for Steel Strucure,Technology Center of Metropolitan Expressway)

2.3.2. 所長の挨拶文

開催当日、寺川研究総務官が代読を行なった。

1 March 2010

OPENING MESSAGE for JOINT-WORKSHOP at BANDUNG
Held by DRCRB in Indonesia and NILIM&PWRI in JAPAN

To Ladies and Gentlemen, and Excellencies.

It is our great honor to have "JOINT-WORKSHOP" today with IRE(DRCRB).

As well known internationally, there is the best cooperation being between Indonesia and Japan both in economy and foreign affairs including industrial technology. Therefore in line with this stream there should be added by us, a new step for promotion of research collaboration sphere, which I believe is really strategic to the ability of improving infrastructure to vitalize the economy, as well as to mitigate and prevent natural disasters, as you think being essential to mutual benefits and welfare of the two countries. And I am sure, beside with Japanese economy, that is really true to Indonesia where is emerging rapid growth of its economy as a great leader of South-East Asia.

Today's workshop is themed with road networks and bridges, and related technology and systems. I am convinced Japan has lots of experience and technology in this field accumulated all through the miracle era of growth in Japanese economy between 1960's to 70's, and also until present stage. We are very willing to share the needed information and lessons with you great Indonesia and relating researchers, to the extent that you make most use of them with the harmonization of conservation of nature and heritages, and with growing economy.

I am sending today our special delegation, a head of which I ask Executive Director of NILIM, Mr.TERAKAWA and Mr.TERAMOTO for this international new challenge, and Mr.HAMADA, research coordinator for local ITS, Mr.NAKAO for Prioritization of Bridge Investments, and Mr.MATSUSHITA for Research Strategy. And Public Work Research Institute as you know our sister institute, is a Co-host organization of this workshop, from which Dr.Zhang will provide Seismic Proof Technology and Mr. KUBO ,Pavement Strategy in Japan. In addition, we send Dr.KONISHI for Bridge Maintenance Reality of Metropolitan Expressway TOKYO, as I guess Indonesia will need much of Expressway networks provided in its future, and to tackle matters due to the overloads issues and deteriorations in your networks.

Finally I would like to imform, this opportunity has been successfully facilitated by Director Ir. Mr.AGUS of IRE, who agreed Memorandum of Research Cooperation with us NILIM last year in TSUKUBA, Japan. Many thanks to Mr.AGUS, there is to be held today's JOINT-WORKSHOP and in accordance with this recognition, to make Memorandum go into its actions actually. So I hope, this challenge will provide lots of useful information and productive knowledge for all participants getting with this opportunity and will be also spread to the next steps in the near future.

Again I say many thanks to all participants and with my apology not being there today. Thank you for your kind attention.

Truly yours,

K. Nishikawa

Kazuhiro NISHIKAWA
Director General
National Institute of Land and Infrastructure Management
Ministry of Land, Infrastructure, Transport and Tourism in Japan.

2.3.3.　記者発表資料

資料配付の場所
１．国土交通記者会
２．国土交通省建設専門紙記者会
３．国土交通省交通運輸記者会
４．筑波研究学園都市記者会
平成２２年２月２５日　同時配付

平成２２年２月２５日
国土交通省国土技術政策総合研究所
独立行政法人土木研究所

インドネシア公共事業省道路橋梁研究所との共同ワークショップ開催について

国土技術政策総合研究所及び土木研究所は、平成 22 年 3 月 1 日から 3 月 3 日までの 3 日間の日程で、インドネシア公共事業省道路橋梁研究所と道路及び橋梁に関する共同ワークショップを開催することとなりましたので、お知らせします。

≪開催の経緯と概要≫

国土技術政策総合研究所は、昨年１１月につくばで開催した「アジア地域国土整備関係研究所長等会議」において、インドネシア公共事業省道路橋梁研究所との間で道路や橋梁の建設及び維持管理の新たな取組等に関する研究協力の覚書を締結しました。

この度、この覚書に基づく活動の一環として、国土技術政策総合研究所及び土木研究所では、インドネシア公共事業省道路橋梁研究所と下記のとおり共同ワークショップを開催することとなりました。この共同ワークショップでは、舗装関係・橋梁関係・道路交通関係のセッションに分かれて，それぞれの研究所からの研究発表と討議等を行います。

記

1.　開 催 日:　平成 22 年 3 月 1 日（月）～3 日（水）
2.　場　　所:　インドネシア国バンドン市
3.　内　　容:　セッションⅠ　舗装関係（日本とインドネシア両国の舗装戦略等）
　　セッションⅡ　橋梁関係（耐震基準と補強、保全戦略その他の対応策）
　　セッションⅢ　道路交通関係（地方におけるITS等）

資料配付の場所
1．国土交通記者会
2．国土交通省建設専門紙記者会
3．国土交通省交通運輸記者会
4．筑波研究学園都市記者会
平成２２年３月５日　同時配付

NILIM
National Institute for Land and Infrastructure Management

PWRI

平成２２年３月５日
国土交通省国土技術政策総合研究所
独立行政法人土木研究所

インドネシア公共事業省道路橋梁研究所との共同ワークショップの結果概要について

このたび、国土技術政策総合研究所及び土木研究所がインドネシア公共事業省道路橋梁研究所と開催した共同ワークショップ（平成22年3月1日から3月3日までインドネシア国バンドン市内の道路橋梁研究所で開催）の結果概要について、お知らせします。

本共同ワークショップでは、インドネシア公共事業省Hermanto Dardak副大臣をはじめインドネシア政府関係者及びバンドン大学関係者を含む約200人の研究者の方々が参加されました。共同ワークショップの結果概要につきましては、次のとおりです。

セッション1（舗装関係）

日本の舗装の保全戦略、インドネシア現地材料によるBUTON舗装等について発表、討議が行われ、今後、BUTON舗装の改良と活用等について研究所間での情報交換と協力を進めることを確認しました。

セッション2（橋梁関係）

わが国の耐震技術体系、インドネシアの地震後の橋梁被災状況等について発表、討議が行われ、地震後のリスク管理や耐震設計・補強等に両国とも関心が高く本分野での情報交換等を進めることを確認しました。

セッション3（道路交通関係）

わが国の地域ITS戦略や構造物の劣化データの取得の役割、インドネシアにおける有料道路政策等について発表、討議が行われ、交通の管理と監視の技術分野に関する情報交換等を進めることを確認しました。

※　BUTON舗装　…　インドネシアで産出される廉価な天然アスファルト材料

公共事業省のホームページに、共同ワークショップ開催の記事が掲載された。

3 Penyelenggaraan Asia Pasific Ministerial Conference on Housing and Urban Development, Tgl. 22-24 Juni 2010 di S

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Minggu, 11 April 2010

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Telaahan Issu Strategis
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Standar Nasional
Hasil Kajian
Makalah / Seminar
Info Prasarana
Info Kegiatan (Proyek)
Petunjuk Penggunaan
Registrasi Penyedia Jasa
Satuan Kerja (Info Umum)
Paket Kegiatan
Lelang (CTI)
Lelang (Semi E-Proc)
Lelang (Semi E-proc Plus)
Dana Stimulus
Anggaran Non Dep.PU
Dinas PU (APBD)
E-Monitoring
Info Media
Guntingan Berita
Tanggapan Berita
Media Cetak PU
Info Lain
Pengumuman
Pustaka
Info Peta
Info Statistik
Info Bencana
Jaringan Eksternal
Forum Kerjasama
Serambi
Gallery Foto
Buku
Opini
Glossary
Dukungan
Network Monitoring

Berita PU

Selasa, 2 Maret 2010 18:15

INDONESIA - JEPANG BAHAS TEKNOLOGI JALAN DAN JEMBATAN

Pusat Penelitian dan Pengembangan Jalan dan Jembatan (pusjatan) bekerjasama dengan *National Instutude for Lands and Infrastructure Management* (NILIM) dan *Public Works Research Institude* (PWRI) dari Jepang menyelenggarakan *Joint Workshop on Road and Bridge* di Bandung, Selasa (2/3).

Dalam sambutannya, Wakil Menteri Pekerjaan Umum Hermanto Dardak mengatakan Kementerian Pekerjaan Umum bertanggung jawab dalam penyediaan dan peningkatan kualitas jalan nasional di Indonesia. Untuk itu, dalam mendukung pertumbuhan ekonomi dan kesejahteraan, Kementerian PU memiliki program Rencana Jangka Menengah Nasional (RPJMN) tahun 2010 - 2014 dalam pembangunan infrastruktur.

Program RPJMN Kementerian PU di bidang jalan dan jembatanan yakni meningkatkan kualitas jalan dan jembatan sepanjang 171.700 km, meningkatkan kapasitas serta kualitas jalan nasional sepanjang 19.400 km dan 27.000 m jembatan. Kementerian PU dalam meningkatkan hidup masyarakat menggunakan standar teknologi dan menerapkan teknologi untuk meningkatkan kualitas inrfrastruktur dalam pembangunan masyarakat di masa depan.

Menurut Hermanto Dardak, dengan kondisi demografi dan geologi Indonesia yang rawan bencana dan gempa bumi sangat diperlukan peningkatan penggunaan teknologi dalam bidang konstruksi. Acara tersebut bertujuan untuk saling tukar menukar informasi dan berbagi pengalaman antara Indonesia - Jepang di bidang kontruksi jalan dan jembatan. Jepang juga memiliki pengalaman dalam manajemen jalan tol di Asia dan manajemen operasional lalu lintas. Dengan tukar informasi dan berbagi pengalaman, diharapkan Indonesia mampu melakukan pembangunan dan peningkatan infrastruktur yang handal di daerah rawan bencana.

"Kondisi alam Indonesia yang rawan gempa tidak jauh berbeda dengan Jepang. Melihat pengalaman Jepang dalam penanganan gempa bumi di Kobe di tahun 90-an, akan sangat membantu kita dalam melakukan pembangunan infrastruktur jalan dan jembatan di Indonesia. Jepang telah melakukan penelitian dan menggunakan teknologi " ujar Hermanto.

Sementara itu, Kepala Badan Penelitian dan Pengembangan Kementerian PU Moch. Amron mengatakan, dengan kekayaan sumber alam yang dimiliki Indonesia, hendaknya penelitian juga difokuskan pada penggunaan material lokal dalam pembangunan infrastruktur. Material lokal dan pengembangan spesifikasi tehnik dapat mengefisiensikan pendanaan. Material lokal seperti aspal buton telah dibuktikan penggunaannya dengan bahan dasar minyak aspal dan peningkatan permukaan jalan sebesar 25 persen.

Materi dibahas dalam worshop tersebut yakni kondisi permukaan Jalan pasca bencana; standar jembatan tahan gempa; serta kebutuhan dan pengembangan perkuatan jembatan di Indonesia. Ke depan, Badan litbang akan secara aktif melakukan penelitian, produksi, penggunaan dan evaluasi teknologi, khususnya dibidang jalan dan jembatan, (ind)

Pusat Komunikasi Publik
020310

2.3.4. 海外出張調書

海外出張調書

出　張　者：研究総務官　　寺川　陽
企画部国際研究推進室　室長　　寺元博昭
企画部国際研究推進室　研究員　　松下智祥
高度情報化研究センター　情報研究官　　濱田俊一
危機管理技術研究センター地震防災研究室　　主任研究官　中尾吉宏

出 張 件 名：国際研究連携推進のための専門家会合
(昨年締結した RDCRB との研究協力覚書に基づく共同セミナー開催の主催・出席)

出　張　先：インドネシア国　ジャカルタ市、バンドン市、ジョグジャカルタ市

出 張 期 間：
平成 22 年 2 月 28 日～平成 22 年 3 月 4 日　(5 日間)（寺川、中尾）
平成 22 年 2 月 28 日～平成 22 年 3 月 5 日　(6 日間)（寺元、松下、濱田）

出張の目的：
インドネシア国の公共事業省研究総局 Agency for Research and Development, Ministry of Public Works、同道路総局 Directorate of Highways, MPW、同道路橋梁研究所(RDCRB)R&D Center for Road and Bridges, ARD, MPW の研究担当幹部及び実務担当専門家と、両国における国土整備関係の共同研究テーマの発掘や研究支援、特に舗装、ITS、耐震関係の研究分野の現状と課題、並びに今後の方向性について、両国の研究成果を発表し討論を行うため開催する別紙の共同ワークショップ会合「Joint-Workshop In Bandung (RDCRB/NILIM/PWRI 共催)」に出席するものである。
また、第１７回アジア地域国土整備関係研究所長等会議（以下、アジア所長会議という。）及び昨年の国際研究推進のための専門家会合（H21.5)、並びに第１８回同会議開催を契機として「昨年 11 月に当研究所 NILIM とインドネシアの研究所 RDCRB とが締結した研究協力の覚書」を実行する具体的な共同事業として取り組むものであり、また本年 10 月～11 月に開催を計画されている「アジア太平洋道路関係共同セミナー(仮称 Next-Plan)」のプレ開催と必要な調整を意図するものである。

出張内容及び成果：
わが国からは、国総研が取り組むプロジェクト研究の概要（予算や研究評価の枠組み等）や道路関係の研究の具体について発表を行なった。インドネシア国からは、研究の重点事項や課題、わが国への技術支援ニーズ等について発表いただいた。ワークショップは、別

紙のとおり、全体会議とテーマ毎のセッションに分けて実施し、関連研究分野における連携のあり方とアジア・太平洋地域における両国の連携の下でのイニシアティブ発揮についての意見交換を公共事業省の幹部等と行ない、また国土整備と環境との調和等に関する視察を合わせて行なった。

本出張の成果としては、科学技術基本計画及び国土交通省技術基本計画においても「アジアとの研究協力の強化」が必要とされていることから、国総研において、アジア地域国土整備関係研究所長等会議を開催するなど、国際的な技術協力の推進のための土台になるものと考える。なお、本会合において上記の情報交換や方策等の討議行うことは、今後の研究活動におけるアジアの連携強化に資するものであると考える。

以下に、本出張の詳細について述べる。

＜3月1日（月）＞

○インドネシア共和国公共事業省(The Agency for Research and Development and, Ministry of Public Works)表敬訪問

・対応相手：公共事業省研究開発総局長　DR.Ir. Moch. Amron 氏
RDCRB 所長　DR.Ir. Agus Bali Sailendra 氏
RDCRB 研究員５名

訪問先では、研究開発総局長 DR.Ir. Moch. Amron 氏を交えて、３研究機関の共同ワークショップ開催への経緯や目的等、今後の研究協力について再確認を行なった。また、研究開発総局長からは昨年の JICA を通じて DR.Ir. Agus Bali Sailendra 氏がアジア所長会議に参加し、国総研及び土研の研究内容及び現地視察が行なえたことに対して御礼の言葉をいただいた。

今後の両国の関係についても話し合い、研究開発総局長も今回のワークショップをきっかけに、より RDCRB が国総研及び土研と親密な関係になることを望まれていた。

写真-1

写真-2

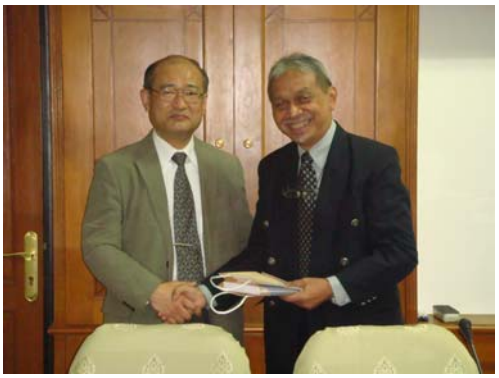

写真-3

写真-4

※　写真-1：公共事業省入口

※　写真-2：表敬訪問時の様子

※　写真-3：記念品贈呈（左:寺川研究総務官、右: Mr. Moch Amron 研究開発総局長）

※　写真-4：日本側訪問団集合写真（公共事業省前にて）

＜3 月 2 日（火）＞

○日本・インドネシア共同ワークショップ開催

【RDCRB 内(Jalan Raya Timur(AH Nasution 264)Ujungberung-Bandung)にて】

(1)Registration

開会式直前に、公共事業省副大臣 DR.Ir.Hermanto Dardak 氏と面会を行なった。

写真-5

写真-6

※　写真-5：Registration 風景（中央：DR.Ir.Hermanto Dardak 公共事業省副大臣）

※　写真-6：Registration 風景

(2)開会式

・DR.Ir.Hermanto Dardak 公共事業省副大臣、DR.Ir.Moch. Amron 研究開発総局長、寺川研究総務官より開会の挨拶を述べた。

・国総研及び土研から RDCRB への記念品を贈呈した。



写真-7


写真-8

写真-9　　写真-10

写真-11

※　写真-7：開会の挨拶（インドネシア）、西川所長のメッセージ紹介（日本）

※　写真-8：ワークショップ会場の風景（左：受付、右：会場、おおよそ 200 名の参加者）

※　写真-9：DR.Ir. Agus Bali Sailendra 所長に記念品を贈呈する寺川総務官

※　写真-10：地元のテレビ取材を受ける寺川総務官と DR.Ir.Hermanto Dardak 公共事業省副大臣

※　写真-11：共同ワークショップ集合写真

(3)General Session

まず初めに、日本側は寺川研究総務官より、国総研と土研についての説明を行なった（研究所の組織体制や現在のプロジェクト研究、研究協力の体制について）。また、インドネシア側からは RDCRB の Mr. I GW SAMSI GUNARTA 氏より、RDCRB の組織、現在の研究内容及びインドネシア国内の道路整備状況についての説明を受けた。

両研究機関の説明を受けて、互いの研究組織体制や両国の研究内容を把握できたことは、今後の研究協力体制の強化につなげるために重要なことであり、Minutes の取りまとめに反映させた。

写真-12

※　写真-12：General Session（左：寺川研究総務官、右：Mr. I GW SAMSI GUNARTA 氏）

(4)Technical Session

Technical Session は 3 分野に分かれて行なわれた。Session Ⅰ では舗装関係を、Session Ⅱ では橋梁関係（耐震を含む）を、SessionⅢでは道路・交通関係（ITS を含む）にそれぞれ分かれ発表と討議を行なった（表-1)。

表-1　各セッションの内容

No.	Session	内容
Ⅰ	舗装関係	日本の舗装の保全戦略、インドネシア現地材料によるＢＵＴＯＮ舗装等について発表、討議が行われ、今後、ＢＵＴＯＮ舗装の改良と活用等について研究所間での情報交換と協力を進める。
Ⅱ	橋梁関係	わが国の耐震技術体系、インドネシアの地震後の橋梁被災状況等について発表、討議が行われ、地震後のリスク管理や耐震設計・補強等に両国とも関心が高く本分野での情報交換等を進める。
Ⅲ	道路交通関係	わが国の地域 ITS 戦略や構造物の劣化データの取得の役割、インドネシアにおける有料道路政策等について発表、討議が行われ、交通の管理と監視の技術分野に関する情報交換等を進める。

【Session Ⅰ】

Session Ⅰ では、土研の久保舗装チーム上席研究員が発表を行なった。久保上席は、「日本における舗装技術について」と題し、現況の舗装整備率や管理手法のあり方及び維持管理に関する技術を中心に発表を行なった。RDCRB からは３名の発表が行なわれた（写真-13)。

本セッションを通じて、インドネシア側は以下の点について問題点や関心を抱いていた。

①舗装メンテナンス技術に対する関心が高い

②Buton Natural Asphalt の有効利用のあり方

③効率的な舗装整備の研究

※　写真-13：Session Ⅰ（発表中の久保上席）

写真-13

【SessionⅡ】

SessionⅡでは、中尾地震防災研究室主任研究官と土研の張橋梁構造研究グループ研究員が発表を行なった。中尾主研は、地震災害に伴う評価法や耐震補強プロジェクトの概要等の説明を行ない、インドネシア側がかかえる問題点等を話し合うきっかけを作り、盛んな議論が行なわれた。張研究員からは、現行の耐震設計基準の設計地震動や耐震性能の設計における考え方、橋脚の耐震補強工法及び落橋

防止システムについて説明した。

本セッションを通じて、インドネシア側は以下の点について問題点や関心を抱いていた。

①橋梁の耐震設計基準改定に関する問題

②橋梁被害の原因についての問題

③長大橋に対する関心が高い

写真-14

※　写真-14：SessionⅡ（発表中の中尾主研(上段)と張任期付研究員(下段)）

【SessionⅢ】

SessionⅢでは、濱田高度情報化研究センター情報研究官と（財）首都高速道路技術センターの小西氏が発表を行なった。濱田情報研究官は、現在の日本のITS技術の紹介及び高知県における実証実験の概要についての発表を行ない、RDCRB研究者から大きな関心を集めた。また小西氏からは、道路橋のメンテナンス手法の紹介や損傷（クラック・変位・振動等）におけるモニタリング技術の説明、取得データの解析手法についての説明を行なった。ITS技術においては、RDCRB研究者内でも関心は高く、現在のインドネシア国内の道路状況を踏まえても重要視されている研究分野であると感じた。

写真-15

本セッションを通じて、インドネシア側は以下の点について問題点や関心を抱いていた。

①ローカルITSの導入に対して関心が高い

②交通安全及び過密交通の解消策について

※　写真15：SessionⅢ（発表中の濱田情報研究官(上段)と小西氏(下段)）

(5)Discussion

各セッション終了後、司会進行役からセッション発表内容及び議事内容を報告し合い、共同ワークセッションは無事に終了した。今回、セッションを３つもうけたことで、先方との研究官同士のパイプがより太いものとなった。この会議の成果を日本側から「３本の矢」の話（１本だと簡単におれるが３本になると丈夫になるとの、毛利元就の言葉）を結びで紹介したところ、インドネシアにも糸をいっぱい集めれば大きな木になるとの話があるとの紹介があり、文化的な近しさも感じられ、会議は成功裏に終了した。

写真-16

写真-17

写真-18

※　写真-16：Discussion の司会進行役を務める寺元室長

※　写真-17：セッションの報告を行なう久保上席研究員

※　写真-18：ワークショップ終了後、日本側訪問団全員に記念品を贈るアグス所長

＜3 月 3 日（水）＞

〇Meeting in Joint Research Program Development

３日は、昨日の共同ワークショップの全体の取りまとめ作業、今後の研究連携に関する協議及び次回の共同セミナー開催における事項についての討議を行なった。事前にＭＩＮＵＴＥＳ（議事録）について調整していたが、実際、まとめるとなると細部に渡り双方から意見が出て大変であったが、何とかまとめ上げることができ、参加者のサインを行った。言いっぱなしになりがちな国際会議もあるが、今回、覚書をさらに具体化する MINUTES を整理できたので、次回以降、さらに具体の研究や支援テーマの特定、現地での状況の確認等に進んでいくことが可能となった。

写真-19

※　写真 19：討議風景

そ　の　他：

〇今後の展開について

今後の展開としては、今回の共同ワークショップの内容を十二分に踏まえ、次回の共同ワークショップ開催に向けての調整を行なう予定である。

2.3.5. Minutes of Session（サイン入り）

INSTITUTE OF ROAD ENGINEERING (IRE/RDCRB)-INDONESIA

NATIONAL INSTITUTE FOR LAND AND INFRASTRUCTURE MANAGEMENT (NILIM)-JAPAN

PUBLIC WORKS RESEARCH INSTITUTE (PWRI)-JAPAN

JOINT WORKSHOPS ON ROADS AND BRIDGES

2-3 MARCH 2010

MINUTES OF SESSIONS

VENUE:

DEVELOPMENT BUILDING-RDCRB

Jalan Raya Timur (AH Nasution 264) Ujungberung-Bandung, Indonesia

In line with the MOC agreed in Tsukuba in 11th November 2009 between RDCRB and NILIM, NILIM & PWRI and RDCRB discussed in Bandung to decide this minutes into action according to the need of respected issues on session 1, 2 and 3.

SESSION I Minutes

1. Date : Mar. 2nd, 2010

2. Place : Room A,Development Building-IRE; Jalan ,Nasution 264 Ujungberung

Bandung,Indonesia

3. Participants for Presentation:

Japan Mr.Kazuyuki Kubo, MSc (sign)

(Leader of Pavement Team, PWRI)

Indonesia Dr. Ir. Siegfried (sign)

(Program Director, Low Cost and Low Volume Road, IRE)

(sign)

Ir. Nyoman Suaryana M.Sc

(Head of Pavement and Materials Laboratory, IRE)

Ir. Sunaryono Nono, M.Sc, (sign)

(Program Manager, Buton Nat Asphalt Research, IRE)

4. Memorandum of Technical Session Pavement

a. Presentation 1 "Pavement Maintenance Strategy in Japan" (Kazuyuki Kubo)

(abstract) In Japan, the length of national highways controlled directly by the Ministry, is close to 20,000km. And the whole pavement conditions are monitored every 3 years. In this presentation, present status of pavement management system is introduced. Then research topics on pavement management would be shown such as required service level of road surface, new materials for maintenance, and so on.

b. Presentation 2 "Indonesian pavement Research Strategy" (Siegfried)

(abstract) The Ministry of Public Works of Indonesia has to ensure 40.000 km of national highways and around 800 km of expressways keep in service. The utilisation of AC/WC technology for flexible pavement and concrete based technology for rigid pavement seems unable to sufficiently accommodate traffic load and climatic situation of Indonesia. The Directorate general of Highways (Bina Marga) has introduced a number of approach in pavement management, including preservation system and Performance based contract. This opened greater opportunity for innovation in pavement technology to ensure the efficient construction, availability of stronger, and longer last pavement. The presentation will discuss the direction of pavement research in Indonesia, which constist of the development of Buton Natural Asphalt Utilisation, the development of flexible and rigid pavement specification, and low-cost low-volume roads.

c. **Presentation 3** "Pavement Condition on Post Disaster": (Nyoman Suaryana)

(abstract) With the complex geological structure, Indonesia is prone to serious disasters, such as : earthquakes and volcanic eruption which damage infrastructures in a short period of time and, moreover, the second phenomena, such as tsunamis and land slide. In recent years disaster caused by earthquake were occured in many place of Indonesia, such as Tsunamis in Aceh on the morning of December 26, 2004, and Indian Ocean earthquake near Padang on September 30, 2009, which measured 7,6 on the Richter scale.
Typical damages on the road pavement such as landslide, settlement and craks. Measures should be taken to repaired roads and bridges. Damages road pavement was repaired such as remove soil and install caution signs, crack shall be sealed immediately, sand bags or gabion installment, and divert water flow and construct temporary drains. There was a great danger that heavy rain would result in secondary disaster such as landslides. The next steps is rehabilitation and reconstruction. In this step it is needed to select the construction with the most effective and economical treatment, other factors must be considered, including safety, construction scheduling, availability of materials, site accessibility, equipment availability, aesthetics, budget for design and construction, and environmental impact.

d. **Presentation 4** "Utilization of Buton Natural Asphalt, Problems and Solutions" Nono/Kurniadjie

(abstract) One way to reduce the use of oil based bituments and improve the performance of asphalt mixtures is adding Buton natural asphalt (Asbuton) in the mixture. The deposit of natural asphalt in the island of Buton, South Sulawesi Province, is estimated to be the largest deposits in the world of containing around 677 million tones of Asphaltic Rocks/soil, which is equivalent to approximately 170 million tones of asphalt.

Prior to early 2000s, Asbuton experiences some difficulties attributed to the quality of Asbuton products, inappropriate use of modifiers, and inappropriate method of application. In 2005 the granular type of asbuton products and pre-blended asbuton that serves as a substitute for oil and asphalt additives were introduced. The substantial issues in the application of Asbuton then were solved.

From laboratory studies, it was known that asphalt mix plus Asbuton demonstrated several advantages such as increasing the value of Marshall stability of up to 19%, value of resilient modulus of up to 36% (25oC) and dynamic stability up to 71%, in comparation to mixture of asphalt mix without asbuton.

These were also proven in IRE's field trials. The hot mix and cold mix Asbuton were tried in some locations such as in Pasuruan, East Java Province, the City of Palangkaraya in Central Kalimantan Province, Gorontalo, Kolaka, Muna (Southeast Sulawesi) and the District Bandung of West Java Province. After several years of observations the asbuton mix demonstrated satisfactory performance.

In 2008, the extraction of asbuton using solvent of organic materials was initiated. This would make the price of asphalt in Indonesia free from the influence of crude-oil prices. The results of laboratory studies showed that asphalt mixtures using pure asbuton has significant effects to performance of road pavement.

e. Result of Discussion

1. It is confirmed that there is a great difference between two countries in asphalt property and construction methods, especially in quality control. However, Indonesian own technologies such as Buton natural asphalt was regarded to be expensive and be used only pavements on bridge deck to assure the water proof in Japan, Japan would expect the refined Indonesian technologies. Japan has an advantage in new technologies such as porous asphalt pavement and pavement monitoring system, and these technologies could be utilized in Indonesia for their efficient pavement management.
2. Similar to Indonesia, Japan also developed several types of asphalt mixture.
3. Japan use cracking ratio and rutting depth to as important indices for judgement of repair pavement. Originally, the formula was from AASHTO (PSI).
4. Porous asphalt is used mainly in expressway in Japan for safety. Advance technology has been established to avoid clogging of the asphalt porous surface.
5. Daily patrol is conducted of about 50-100 km/day to collect road condition data visually. Road Surface Measuring Device is used every three years.
6. Asbuton should be evaluated in full life cycle costs not only initial (construction cost). Besides high transportation cost, the high cost of Asbuton also due to the effort to extract the bitumen from the mineral. Japan side will support Indonesian side regarding the Asbuton under the cooperation including related industrial sectors.
7. Japan uses natural asphalt (Trinidad Lake Asphalt) is used in bridge decks not in roads to assure water does not penetrate into decks (to avoid corrosion).
8. Current solution for flooded roads in Indonesia is simply to raise the road level or use rigid pavement. Japan however, never experience the flooded roads and hence the experiences for this problems is still limited. Japan is now developing permeable pavement to quickly drain the water from the road surface to avoid water pounding on the roads. According to Japan's experience the use of rigid pavement would not be recommended because the maintenance is more complicated than flexible pavement.
9. Asphalt stabilized base is more popular than cement treated base because CTB is too rigid and the maintenance is also difficult.
10. In Road Surface Measuring Device, crack ratio (ratio of cracking area to section area) is automatically obtained using camera and image analyzer.
11. Pavement problems should be solved not only in table but also in the field. For that, Japan expert would like to come back to Indonesia for further discussion.
12. Indonesia manage about 52% unpaved road. The road map on Low Cost and Low Volume Road has been established in RDCRB, which 2010 is focusing on unpaved road and the following years will be focused on low cost and low volume road. Japan has been developing low cost road. For that, the cooperation on low cost and low volume road is needed.

Themes of research cooperation

Following themes are recommended to cooperate between two countries;

i. Pavement Management System, including materials for maintenance and monitoring method
ii. Advance technology in pavement construction such as in-situ recycling method, additional pavement performance, such as higher rutting resistance (eg Stone Mastic Asphalt, SMA), low-noise pavement and permeable pavement
iii. Development of Buton natural asphalt technology
iv. Low cost and low volume road technology

Method of cooperation	i.	Information would be requested or provided through the contact person named below according to need.
	ii.	Holding workshops and personnel exchanges would be considered according to need.

Contact persons :

Japan : Leader of Pavement Team, PWRI

Mr. Kazuyuki Kubo, M.sc

(k-kubo@pwri.go.jp)

Indonesia:

i. Senior Researcher on Pavement and materials Division,IRE

DR. Ir. Sjahdanulirwan, M.Sc

(msjahdanulirwan@yahoo.co.id)

ii. Leader, Low Volume Road Working Group, IRE

DR. Ir. Anwar Yamin, M.Sc

(ayplg@yahoo.com)

SESSION II Minutes

1. Date : Mar. 2nd, 2010

2. Place : Room E , Development Building-IRE; Jalan ,Nasution 264 Ujungberung Bandung,Indonesia

3. Participants for Presentation:

Japan	i.	Mr.Yoshihiro Nakao (Senior Researcher of Earthquake Disaster Prevention Division, NILIM , nakao-y92rr@nilim.go.jp)	(sign)
	ii.	Dr.Guangfeng Zhang (Researcher of Bridge and Structural Technology Research Group, PWRI, tyou44@pwri.go.jp)	(sign)
	iii.		
Indonesia	i.	Ir. Nandang Syamsudin, MT (Head of Bridges and Structures Laboratory, nandangesye@yahoo.com)	(sign)
	ii.	Redrick Irawan, ST, MT (Program Director, Long Span Bridge Research, redskin175@yahoo.com)	(sign)

4. Memorandum of Technical Session: Disaster and Bridges

a. Presentation 1: "Philosophies in Earthquake Disaster Mitigation - Multiple Perspectives" (Yoshihiro Nakao)

(abstract) Earthquake disaster mitigation is classified into in-advance measurements and crisis managements. The speaker will introduce the philosophies of in-advance measurements in Japan with focus on seismic design specifications and seismic retrofitting of highway bridges. In the presentation, philosophy of crisis management will be also illustrated by briefing a strategy planning for post-earthquake quick restoration of road networks.

b. Presentation 2: "Seismic Design and Seismic Retrofit for Highway Bridges in Japan" (Guangfeng Zhang)

(abstract) Seismic design methods for highway bridges in Japan has been developed and improved based on the lessons learned from the various past bitter experiences after the Great Kanto Earthquake (M7.9) in 1923. The current version was revised based on the performance-based design concept in 2002 with the propose to enhance the durability of bridge structures for a long-term use, as well as the inclusion of the improved knowledges on the bridge design and construction methods. In this presentation, basic concepts of the current seismic design and seismic retrofit are introduced.

c. **Presentation 3** "Report on Bridges Infrastructure Investigation on Post Disaster" (Nandang Syamsudin)

(abstract) The geological features the Indonesian archipelago is characterized by the collision between large tectonic plates. The collision of Eurasia and India-Australia plates influences the western part of Indonesia, while on the eastern part of Indonesia these two plates collide again with the Pacific plate from eastern direction. These movements cause high seismic risks and active volcanic in Sumatra, Java, Flores, Maluku, Sulawesi and Irian Jaya islands. This report describes the investigation results of post earthquake damage on the bridge infrastructure during the last five years, with a magnitude over six on the Richter scale in several regions of Indonesia, like Nabire, Aceh, Nias, Yogyakarta, Bengkulu, West Java and West Sumatra. The earthquake impacts on bridges generally characterized by :

- Movement of superstructures in lateral direction
- Increases in lateral dilatation between old bridges and new widened bridges
- Slumping of the approach embankment to the bridge
- Cracking/ splitting of wing walls at abutments

d. **Presentation 4** "The Need and Development for Bridges Strengthening Technology in Indonesia" (Redrik Irawan)

(abstract) Factors causing the structural damage of bridges mainly relate to the decrease of load carrying capacity and/or increase of load factors. Maintenance is a decisive factor influencing the bridge resistance and durability. Inadequate routine maintenance influences the degradation rate of the bridge even if the structure is well constructed with the use of materials and elements of high quality.

Bridge damages can be also attributed to structural model of the bridge. Failures can happen due inappropriate structures that leads to fatigue of concrete and steel of structural components. Bridge strengthening focuses on repairing the structural damage and deterioration. The capacity and durability of bridges can be restored when causes of damages and deteriorations of the concrete and steel bridges is counteracted by the strengthening method. Cases of bridge damages and their remedial actions for concrete and steel bridges are described more detail in this paper. The case study of the Sei-Kedang Pahu bridge strengthening is incorporated to show wider scope of an actual remedial action.

e. **Results of Discussion** Common research interests were found in the fields of seismic design and retrofit of highway bridges and post-earthquake crisis management. Following items were discussed:

1. The method how to repair the structure post - earthquake depend on the level of damages and condition of bridges.
2. Three philosophies in earthquake disaster mitigation were introduced from the following aspects by NILIM (Japan) .
    a. Seismic design specification for highway bridges
    b. Seismic retrofitting of highway bridges
    c. Post-earthquake quick restoration of road networks
3. The IRE mentioned there are four causes factors of bridge damage after the earthquake:

a. Lateral movement of bridge superstructure
b. Lateral dilatation between main superstructure and added structure
c. Settlement of bridge approach bridge embankment
d. Crack on retaining wall and abutment

4. Overloading is the one of factors has made the failed of bridge. It is a common problem of Indonesia.
5. The technological information exchange regarding to long span bridges in Japan will be supplied by NILIM under the cooperation with related organization.

Themes of Research Information Exchange

Technical information exchange related to the mutual interests including the following topics would be beneficial.

i. Seismic hazard evaluation (Deterministic- & probabilistic ground motion estimation)
ii. Earthquake disaster information including tsunami disaster
iii. Information and communicative technologies for immediate information- collection and sharing
iv. Earthquake damage estimation for urgent response and notification
v. Seismic design technologies for highway bridges
vi. Seismic retrofit technologies for highway bridges
vii. Seismic evaluation of highway bridges after earthquake
viii. Emergency function recovery of highway bridges damaged in earthquake
ix. Prevention of collapse of highway bridges due to tsunami attack

Contact persons

Japan :

i. Head of Earthquake Disaster Prevention Division, NILIM

Takamiya Susumu (takamiya-s92tc@nilim.go.jp)

ii. Leader for Rehabilitation and Earthquake Engineering, PWRI

Jun-ichi Hoshikuma (hosikuma@pwri.go.jp)

Indonesia:

Leader, Long Span Bridge Technology Development

Redrik Irawan

(redskin175@yahoo.com)

SESSIONⅢ Minutes

1. **Date :** Mar. 2nd, 2010

2. **Place :** Room C , Development Building-IRE; Jalan ,Nasution 264 Ujungberung Bandung,Indonesia

3. **Participants for Presentation:**

Japan	i.	Mr.Shunichi hamada, MSc (Research Coordinator for Advanced Information Technology,NILIM)	(sign)
	ii.	Dr.Takuyo konishi (Technology Center of Metropolitan Expressway)	(sign)
Indonesia	i.	Ir. Pantja Dharma Oetojo (Head of Traffic and Environmental Laboratory)	(sign)
	ii.	DR. Rudy Hermawan Karsaman (Board Member of Indonesia Toll Road Authority)	(sign)

4. **Memorandum of Technical Session** **Traffic and Technology**

a. **Presentation 1** "Local ITS Strategy " (Shunichi HAMADA)

(abstract) Assisting safety driving systems using vehicle-infrastructure cooperative systems are developed in Japan. On the other hand, low-cost and easy-installed Intelligent Transport Systems (ITS) are developed as the feasible system to be easily installed in the local area. For example, systems warning of cars from opposite direction at narrow road have been developed and deployed in mountainous roads in Kochi prefecture, so called "grass-roots ITS". In this presentation, low-cost and high-feasible ITS in Japan are introduced.

b. **Presentation 2** "Role of structure condition data acquisition on bridge maintenance activities" (Takuyo KONISHI)

(abstract) Acquisition of information data concerning bridge condition began to be applied in expressway maintenance field. Effective use of self-inform structure (i.e. Smart Structure) is strongly desired in maintenance field especially in busy

network expressway. Inspection of their structures is mostly dependent on human visual inspection but it requires many labors and special equipment for human safety. Important point of the smart structure is how to find out symptoms of deterioration or results of accidental damage from limited information obtained from small number of low cost sensors. Application of data acquisition and wireless transportation of damage information will be presented in the presentation. Contents of presentation are 1) maintenance of bridge 2) identification of damage from ordinary condition data, 2) weigh in motion, 3) monitoring of damage (crack, displacement, vibration) 4) strategy of alarming, etc.

c. **Presentation 3** "Strategy on ITS Development in Indonesia" (Pantja D. Oetojo)

(abstract) In general, road traffic is growing rapidly in Indonesia. In major cities like Jakarta, it is figured growing by 11 % annually. In2007, jakarta was estimated occupied by 6.3 million vehicles, around 700 new private vehicles are dragged into the road network per day which requires 3 km new road lane. Such condition can lead to significant increase in vehicle operating costs, loss in travel time, and also physical losses due to decreases in average operating speed. The utilisation of ITS in Indonesia to anticipate such situation was started in early 1990s bey the establishment of Area Traffic ontrol System in Bandung. This system has widely introduced in Indonesia, however, due to lack in maintenance most of systems have failed to operate. This paper will cover state of the art of ITS in Indonesia and set forth the idea about the strategy of local/municipal government in Indonesia to implement ITS technology. It may contain prioritisation of ITS program, rol sharing among parties, as well as possible form of cooperation between stakeholders in yhe operation of ITS.

d. **Presentation 4** " The Policy and Evaluation of Electronic Toll Collection System Application in Indonesia" (Rudy Hermawan)

(abstract) In order to smoothly support traffic flows in toll road safely, comfortable and efficient, one of its aspect related to toll collection system adopted. Toll Collection System is activities chain related with toll transaction service to the user, transaction control, administration of revenue collection and other supporting procces. In principle, toll collection system must be rely on quick, precise, secure and comfortable service for the user, ensuring guarantee for the user and operator that transaction has been done in accordance with tarif applied, compatible and integrated with existing or future system and considering technology development and human resources management.

To increase toll road service in Indonesia, the toll collection system or payment transaction aspect at toll gates need to be accelerated. One of the choice to acceleration is to apply toll collection electronically or Electronic Toll Collection (ETC) System.

The advantage of this system adoption are :

i. Accelarate transaction time and increase service capacity
ii. Decrease cash moneyneed to be handled and increase security
iii. Increase transaction accuracy level and avoid human errors
iv. Increase the efficency of human resource number for toll gates servicing

In ETC adoption implementation, some of the operators made joint operation in procurement process and operation by pointing one of the Bank as transactio

and card manager to ensure the system interoperability in every roads managed by those operators.

In accordance with the system implementation schedule throught out all toll roads in Indonesia, as first the step and transistion period, this system has been adopted at Jabodetabek area.

This paper discuss the result of implementation so far such as trend of usage, problem encountered etc, including recommendation to develop the system further in the future.

e. **Result of Discussion**

Japan has an advantage in local ITS technologies such as systems warning of cars from opposite direction at narrow road, and these technologies could be utilized in Indonesia.

1st Paper: Local ITS Strategy, by Mr Shunichi HAMADA.

The paper introduces a whole ITS technology developed recently, and explained in more detail application of ITS technology in local narrow roads, particularly in rural areas. ITS devices used is claim simple and relatively cheap. It managed alternate priority given to vehicles entering a narrow lane. It warrants the driver either he/ she should enter the lane or wait until the road lane clear.

This type of ITS technology may be introduced in typical residential areas with narrow lane of streets, to overcome interlock traffic because of vehicles entering narrow street without knowing that other opposing vehicle entering in the same time.

Further, ITS technology and application are requested to introduce in more detail for Indonesian engineers and researchers.

2nd Paper: Role of structure condition data acquisition on bridge maintenance activities, by DR Takuyo KONISHI.

The paper explain inside ITS technology applied in monitoring structural bridges damages using strain gauges connected to transmitter for sending information to the computer in offices. Similar technique may be applied to obtain vehicle weights, so characteristic of traffic loads may be detected. This type of ITS technology is suitable to be developed in Indonesia, particularly in monitoring the distribution of vehicles weight. Study such as easiness, applicability, economic, and durability of any element of devices under Indonesian condition need to be carried out. The simplicity and easy operation of application of the system seem to be suitable for case of overloading in national highway network.

3rd Paper: The policy and evaluation of electronic toll collection system application in Indonesia, by DR Rudy Hermawan.

The paper explain application of electronic toll collector (ETC) in Toll road system. The system use "smart card" to pay the toll by tagging or touching the card to the "card reader" and then go. The system in a part of the payment system in toll booth. The ETC up to now has been achieved up to about 10% of the total transaction, the rest still use manual system. In the future, this type of collector system need to be upgraded to the free system, i.e. the payment system that is not required for car driver pass through the gate by toughing the card to the reader. Culture condition and education to the traveler about free system may be studied in order to introduce the more efficient free system for

transaction of toll payment.

4th Paper: Strategy on ITS development in Indonesia, by Mr. Pantja Dharma Oetojo.

The paper discussed situation recently in Indonesia, e.g. coordinated Traffic control system which has been used in urban areas such as in Jakarta and Bandung, but due to some reasons the most of the system works only partially or even back to conventional method, i.e. isolated single phase traffic light. In IRE office, traffic researchers have been developing several traffic management devices such as automatic traffic counter-classifier capable to weigh axle loading using telemetry technology to send data from field to office. Others are system information on traffic and other road data which is designed accessible by any stake holders, mobile wireless stand-alone traffic light to manage traffic pass through area under construction. All the works by IRE are still under development. IRE face luck of expert for developing electronic devices. Urgent problem in traffic situation mostly in urban areas are domination of motorcycles in traffic flows. It needs special management to overcome the problem which may use ITS.

Themes of research cooperation:

Following themes are recommended to cooperate between two countries;

i. Local ITS, such as low-cost, easy-installed and high feasible ITS
ii. Highway Traffic Control, Monitoring Technology and Electronic Toll Collector.
iii. Traffic safety and reduction of traffic congestion.

Method of cooperation:

i. Information would be requested or provided through the contact person named below according to need.
ii. Holding workshops and personnel exchanges would be considered according to need

Contact persons :

Japan

i. Head of Intelligent Transport System Division, NILIM

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Head of Planning and Technical Services, Traffic Laboratory

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General

Regarding to not being included in Session 1, 2, 3, there are access points on respective side as below:

Indonesian Side	Head of Division, Progrram and Institutional Collaboration-RDCRB IGW Samsi Gunarta samsi.gunarta@gmail.com samsi@pusjatan.pu.go.id	Sign 
Japan Side	Director, International Research and Promotion Division-NILIM Hiroaki Teramoto teramoto-h92tb@nilim.go.jp	Sign 

(Reference information)

Questionnaire from Japan side to RDCRB for the JOINT-WORKSHOP being fruitful

○SESSION I

Q1. Summary of BUTON pavement including its technology and history of its works

Q2. Achievements of monitoring surveillance

○SESSION II

Q3. Budgets of maintenance for bridges and its strategy of investment in Indonesia

Q4. Seismic design standard for bridges in Indonesia

○SESSIONIII

Q5. Status of installation of ITS(Intelligent Transport System) in Road network in Indonesia

Q6. Interests and concerns of your side in ITS

Q7. Interests and concerns of your side in the matter of overloads against roads and related countermeasures

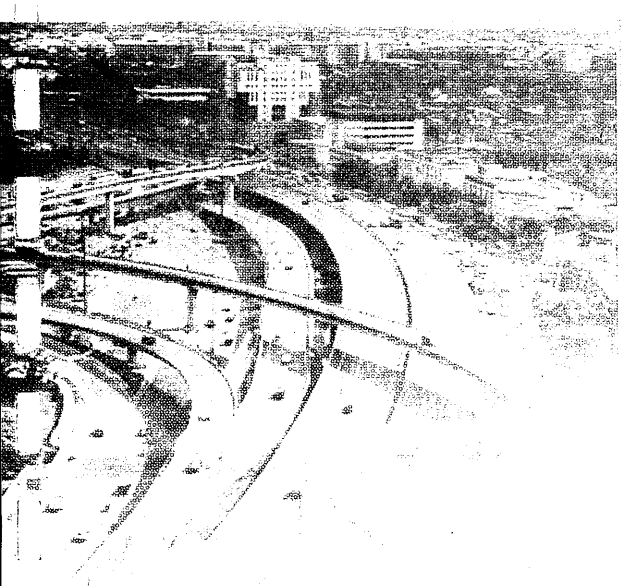
2.3.6. 当日の配布資料一式

ISBN: 987-602-8256-15-5

JOINT WORKSHOP ON ROAD AND BRIDGE

Bandung, March 02, 2010

PROCEEDING



RDCRB

RESEARCH AND DEVELOPMENT CENTRE FOR ROAD AND BRIDGE

NILIM

NATIONAL INSTITUTE OF LAND AND INFRASTRUCTURE MANAGEMENT - JAPAN

PWRI

PUBLIC WORKS RESEARCH INSTITUTE - JAPAN

PROCEEDING

JOINT WORKSHOP ON ROAD AND BRIDGE

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Ir. Nyoman Suaryana, M.Sc
Ir. Nono, M.Eng.Sc
Ir. Kurniadjie, M.Sc
Ir. Roestaman, M.Sc
Ir. Imam Murtosidi
Ir. Nandang Syamsudin, MT
Rulli Rinastra, ST, MT
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PWRI
Kazuyuki Kubo, M.Sc
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NILIM
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Shunichi Hamada, M.Sc
DR. Takuyo Konishi

BPJT
Ir. Rudi Hermawan

ISBN : 978-602-8256-15-5

Research and Development Center for Road and Bridge (RDCRB)
The National of land and Infrastucture Management (NILIM) Japan
The Public Works Research Institute (PWRI) Japan

FOREWARD

FOREWORD

Challenges and problems in the field of road infrastructure increasingly requires treatment through the use of applied technology. R & D institutions in the field of roads and bridges, as well as Research and Development Center for Roads and Bridges (RDCRB) became central to the search for invention and innovation in these problems. Ministry of Public Works Republic of Indonesia, as an institution managing road, has golas in the National Medium – term Development Plan (RPJMN) 2010 – 2014. Those goals are: improve the quality of roads and bridges along 171,695 km, and increase capacity and quality of 19,407.27 km of national roads and 26,957.83 m of bridges.

Objectives set in the RPJMN were put in detail in the respective goals of the Ministry of Public Works Strategic Plan 2010 - 2014. To bridge the research and development activities in RDCRB with the Strategic Plan, the institution had prepared R & D focus and sub focus that have relevance to the achievement of the goals of Ministry of Public Works. To strengthen the implementation of the focus and sub focus, RDCRB prepared future research that pours into technology roadmap.

Meanwhile, R & D capacity owned by RDCRB can be assessed are not sufficient to achieve the target of research in the roadmap. There are limited resources which institution has to operationalize the plan that allow the targets achievement. RDCRB Strategic Plan 2010 - 2014 implements a policy that directs cooperation with other institutions, both domestic and international. Through this cooperation, RDCRB is projected to work more optimally in achieving national development goals, through transferring technology, strengthening R & D capacity, as well as R & D result information axchange by all parties working together. Workshop involving three R & D institutions came from Indonesia and Japan which is conducted at the moment, can be indicated as an attempt to implement the policy mentioned above.

In substance, there are two papers presented in these proceedings describes topics that can be shared in reference to a future research program. Pavement and Expressway session put for papers that map strategies in research and development of the two countries. Mr. Kazuyuki Kubo (Public Work Research Institute Japan/ PWRI) expresses paving strategy in Japan in the paper entitled **Pavement Strategy in Japan**, while research strategy in Indonesia delivered by Prof. Furqon Affandi (RDCRB).

Related to the problems often faced by both countries, Ir. Nyoman Suaryana (RDCRB) told the paper entitled **Pavement Condition Post Disaster**. This paper is considered important because the two countries frequently hit by disasters, particularly earthquakes that also influence the condition of pavement. Located on the Pacific plate which is still active, disaster mitigation efforts in paving should always be improved. In particular, the bridge and the disaster session presents a four papers from three parties: PWRI, National Institute for Land and Infrastructure Management (NILIM), and RDCRB. Dr. Guangfeng Zhang (PWRI) present a paper titled **Earthquake - Proof Standard of Bridges**. Bridge investigation report after disaster, especially for Indonesian condition is delivered by Ir. Nandang Syamsudin (RDCRB). As support for the handling of this disaster issues, Ir. Redrik Irawan delivered a paper titled **The Need and Development for Bridges Strengthening Technology in Indonesia**. This paper describes position of bridge strengthening technological development in Indonesia, which is important for bridge maintenance and also in bridges disaster mitigation.

In Traffic and Technology Session, research strategies in the field of Intelligent Transportation System (ITS) in Indonesia presented by Ir. Pantja Dharma Oetojo, M.Eng.Sc (RDCRB). Mr. Sunuichi Hamada, M.Sc (NILIM) completes the contribution of the research strategy in the session through a paper entitled **Local ITS Strategy**. In the context of highway maintenance policies and overloading countermeasures, Indonesian Toll Road Authority (ITRA) make an important presentation to the strategies and policies that can be an valuable input for the next research programs.

The papers presented in this proceeding can be considered as valuable inputs regarding technological achievement of two countries. The workshop is expected to move further to technological exchange, capacity building R & D resources, and to solve road development problems. Associated with R & D strategy in the future, this event is a leap forward for RDCRB to make himself more "open" to the external environment than this moment. In the future, RDCRB leads to the fifth R & D generation that works across – boundary alliances, which means the institution has actively involving all parties concerning on the production, use, and technological evaluation, especially in roads and bridges.

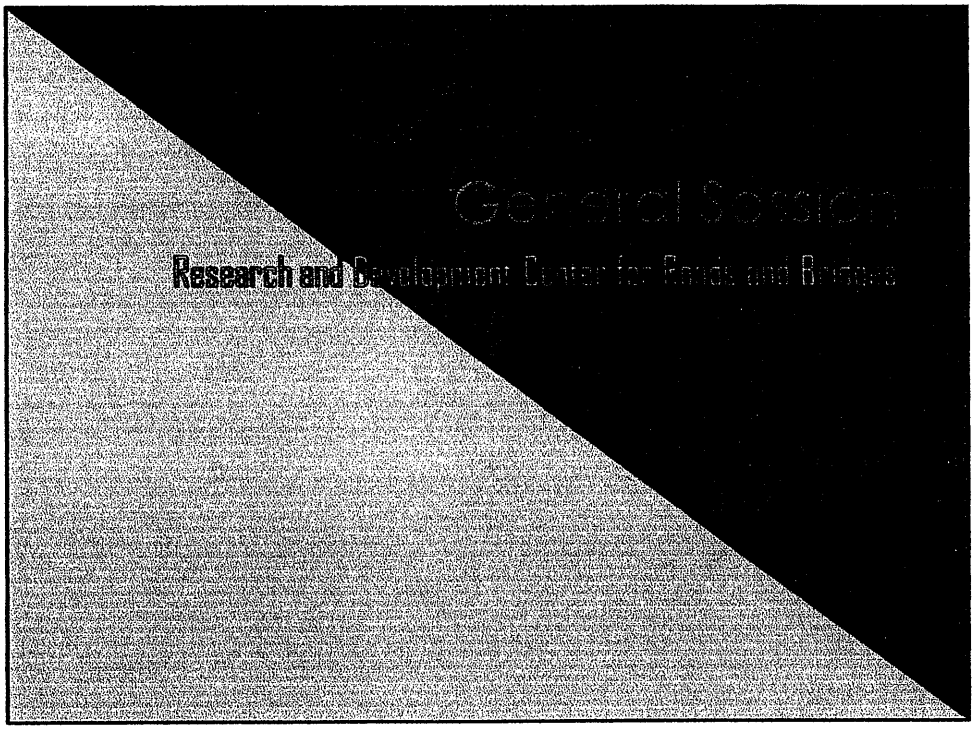
Bandung, March 2nd, 2010
Head of Research and Development Centre for Road and Bridge

Ir. Agus Bari Sailendra, M.Sc

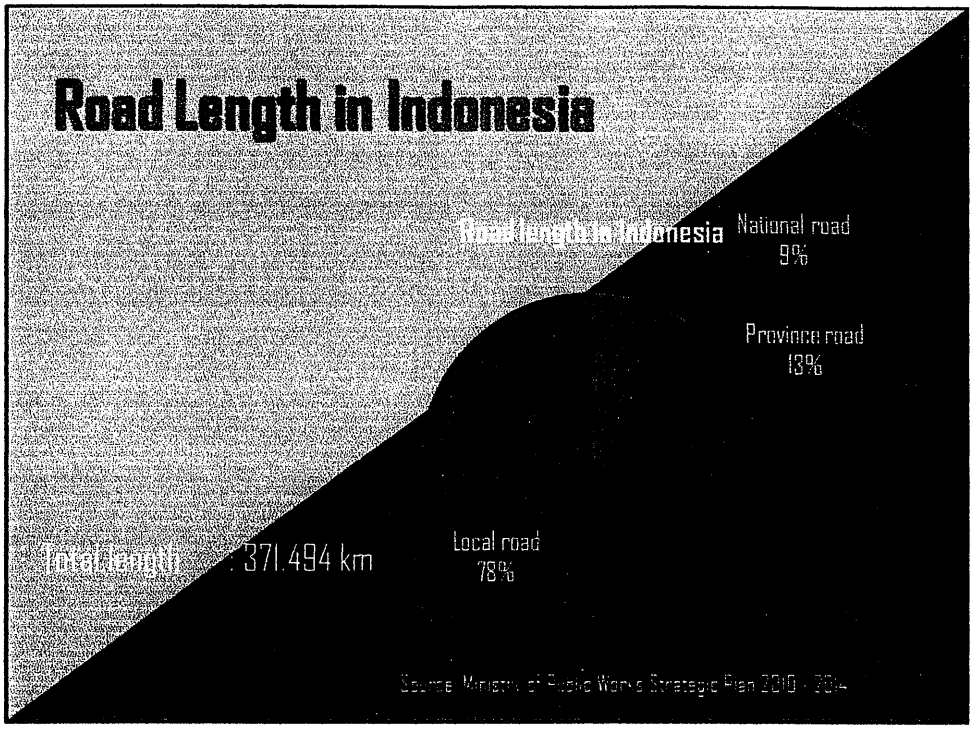
LIST OF CONTENTS

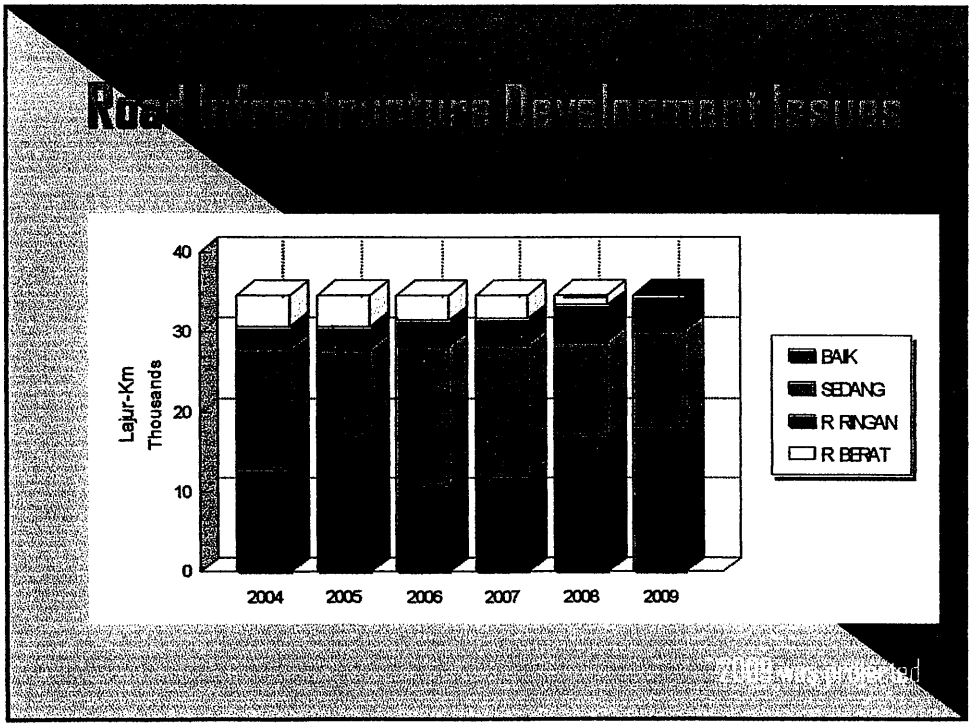
LIST OF CONTENTS

GENERAL SESSION


General Session
Research and Development Center for Roads and Bridges


Road in Indonesia
Condition and Issues


Road Length in Indonesia
Road length in Indonesia
National road
9%
Province road
13%
Local road
78%
371.494 km


Lajur-Km
Thousands
40
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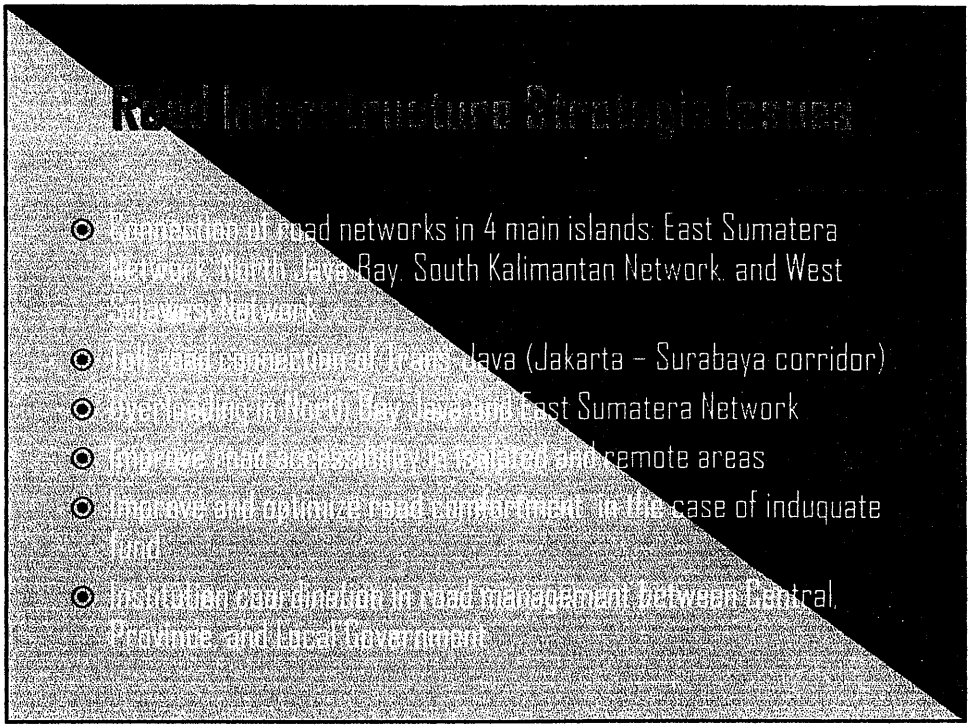
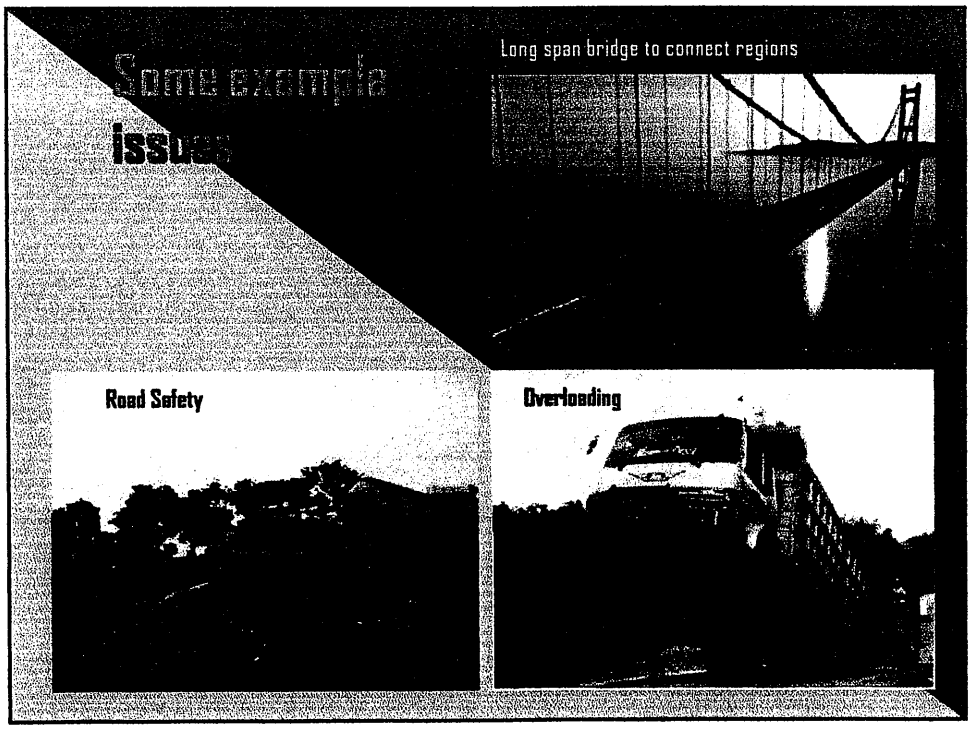
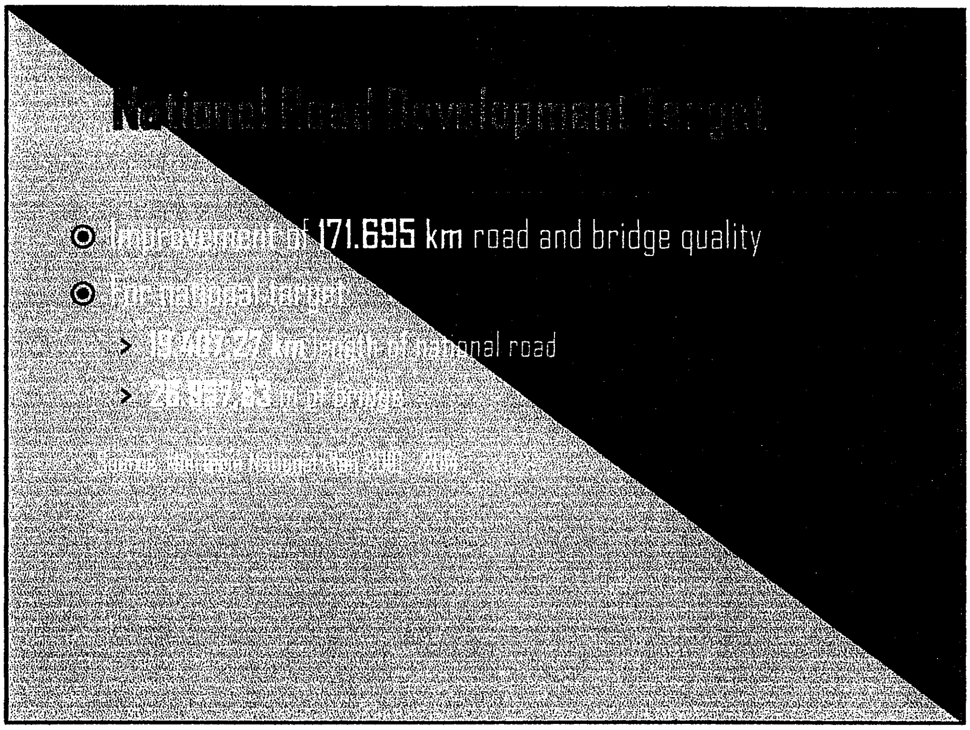
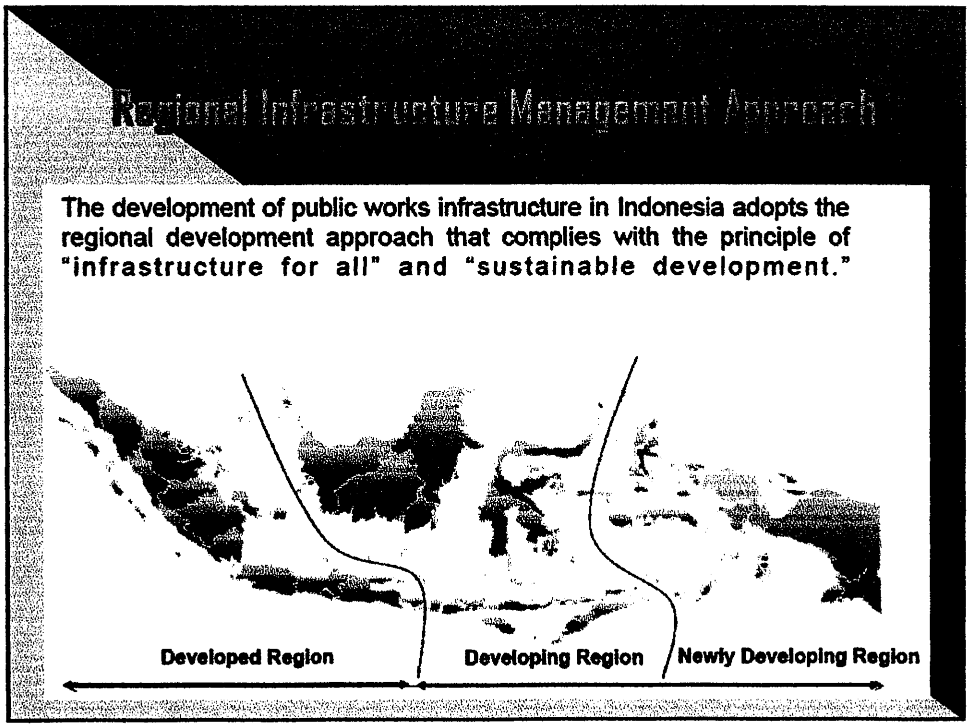
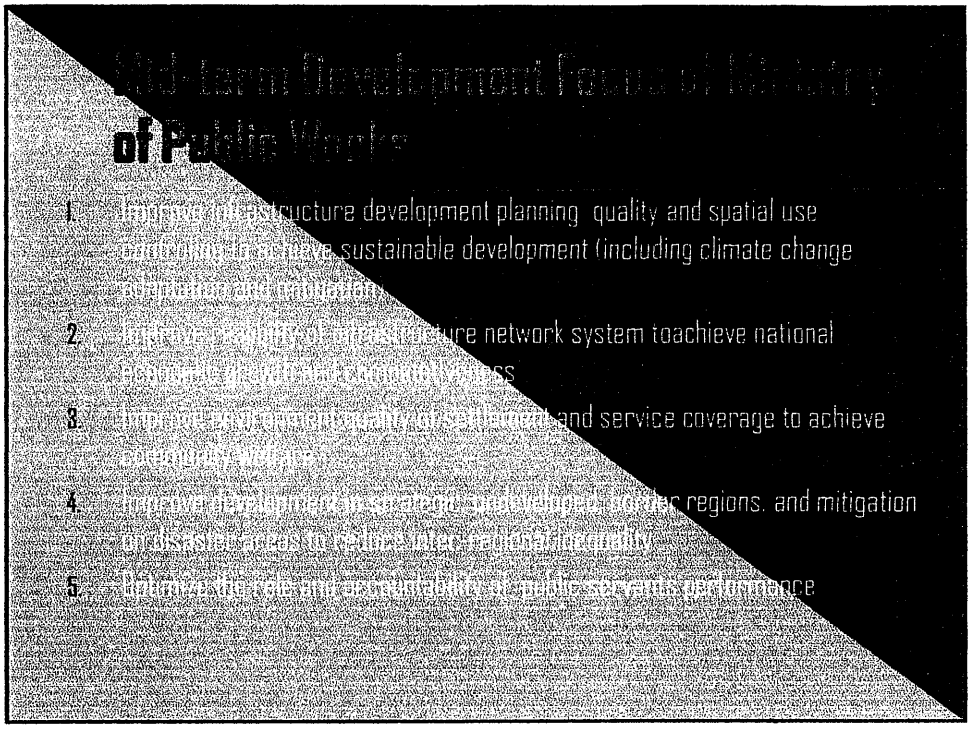
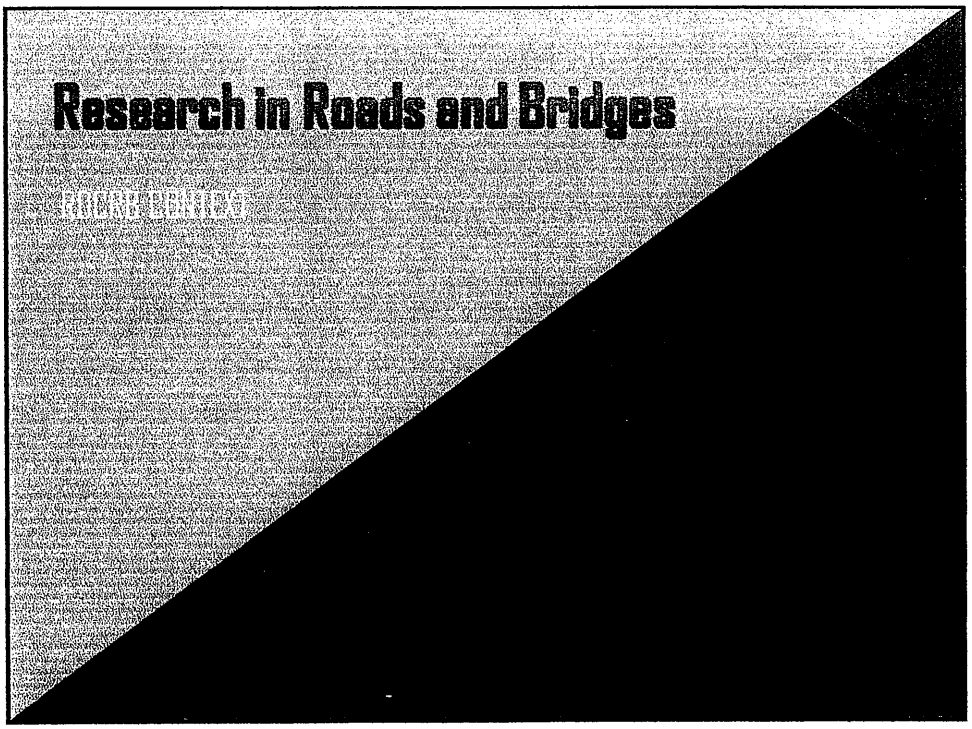

Road Infrastructure Strategic Issues
Connection of road networks in 4 main islands: East Sumatera Network, North Java, Bali, South Kalimantan Network, and West Sulawesi Network
Toll road connection of Trans Java (Jakarta – Surabaya corridor)
Overloading in North Bali, Java and East Sumatera Network
Improve road accessibility to isolated and remote areas
Improve and optimize road maintenance in the case of induquate fund
Institution coordinating on road management between Central, Province and Local Government


Some example issues
Long span bridge to connect regions
Road Safety
Overloading


National Road Development Target
Improvement of 171.695 km road and bridge quality
For national target
nal road


Regional Infrastructure Management Approach
The development of public works infrastructure in Indonesia adopts the regional development approach that complies with the principle of "infrastructure for all" and "sustainable development."
Developed Region
Developing Region
Newly Developing Region


Mid-term development focus of Ministry of Public Works
1.
2.
3.
4.
5.


Research in Roads and Bridges

RDCRB Focus to Support National Development


To establish and promote the use of sustainable technology which adapt to global climate change


To establish applicable infrastructure technology to support national economic growth


To establish road and bridge technology involving community participation


To establish technology which suitable with local environment condition and local wisdom


Institution capacity building

GOALS	TARGETS	POLICIES
To establish and promote the use of sustainable technology which adapt to global climate change	Environmentally friendly road consists of recycled & reused materials, and engineered pavement materials	The activity is focused to reusable materials and tailing with large production, negatively impact to the environment and potentially be used as road materials. Integrating environmentally friendly road concept into design and construction guidelines to improve road environment Integrating the effort for adaptation and mitigation to global climate change into
	To establish tunnel technology to increase land use effectiveness and to reduce environmental impact	Based on strong literature study and observational method on tunnel construction projects in DG of Highway or DG of Water Resources to develop manuals and to utilize researcher exchange
	Urban road network system technology	Focused to system planning and technology to accommodate the most weak road users including road furniture.

GOAL	TARGETS	POLICIES
To establish applicable infrastructure technology to support national economic growth	Pavement technology which fit with climate characteristics and specific Indonesian condition	1. To optimize research collaboration between research institutions 2. Full scale test may only be carried out through a more selective procedure 3. To build exclusive road test facility 4. Besides technical aspects, economic feasibility of the technology shall be completely scrutinized
	To develop ground improvement technology to assure a stable road foundation	Based on strong literature study and observational method on construction projects in DG of Highway to develop manuals and to utilize researcher exchange
	Long span bridge technology which integrating regional economic growth	Based on strong literature study and observational method on construction projects in DG of Highway to develop manuals and to utilize researcher exchange
	To establish technology to reduce traffic congestion so as to reduce gas emission	To develop traffic monitoring center (TMC) prototype as a reference for TMC in urban
	Road safety technology	Focused to road safety along Trans Asia and ASEAN Highway route
	To develop manuals on road serviceability level and geometric design parameters	Updating Indonesian Road Capacity Manual 1998 with modification to traffic planning and geometric design

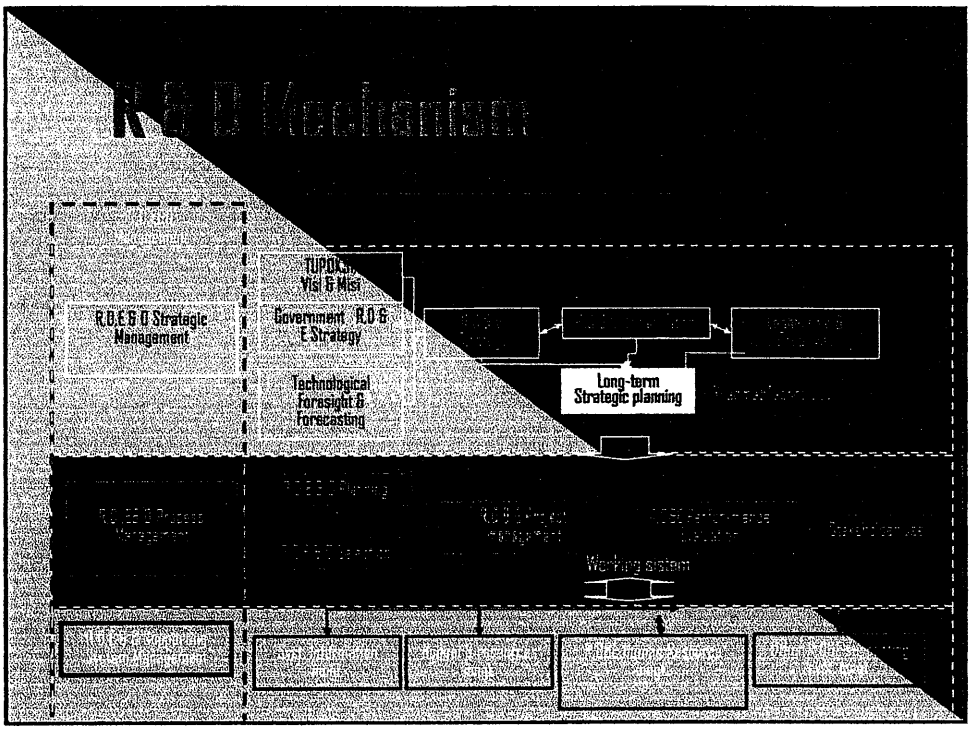
GOAL	TARGETS	POLICIES
To establish road and bridge technology involving community participation	To develop applicable road technology which involve local community participation	Focused to area with low accessibility to road technology and low regional accessibility Simple technology which can be applied to districts community with minimum training
To establish technology which suitable with local environment condition and local wisdom	Road technology using local materials and disaster prevention and mitigation	Based on strong literature study and observational method on construction projects in DG of Highway to develop manuals and to utilize researcher exchange
Institution Capacity Building	To conduct beurocational reform	To perform performance based remuneration
	To provide research infrastructure and laboratories	Based on research road map and master plan
	To make IRE as center for technology transfer	IRE as a center for technology verification institution
	To increase local research and laboratory institution	To cooperate with local research and laboratory institution

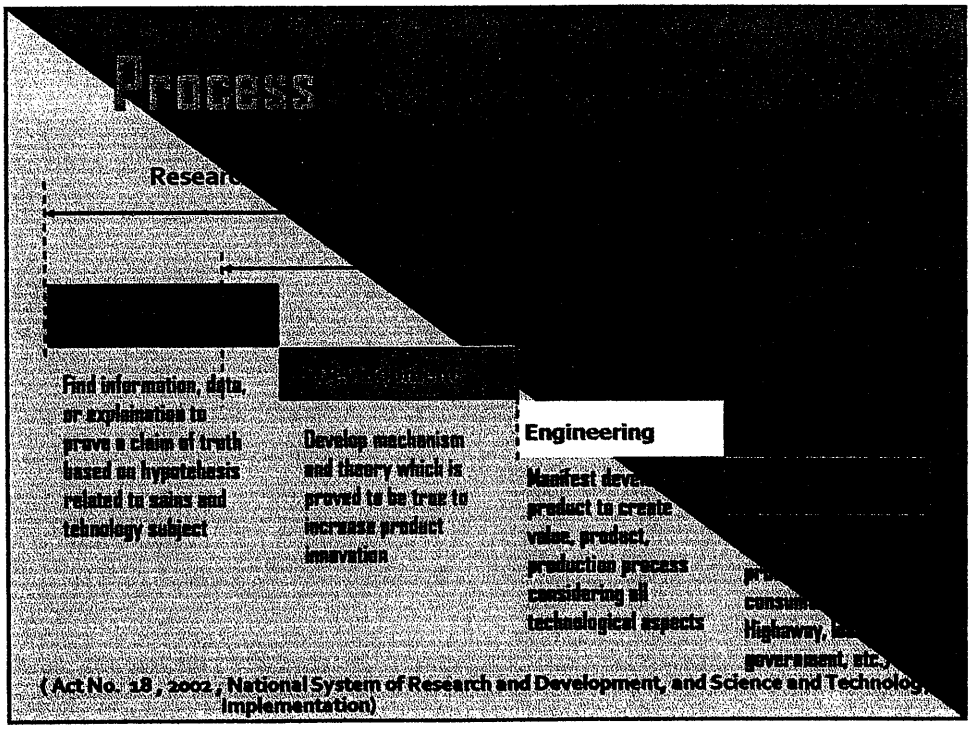
Mid-term R & D Projected Funding (1)

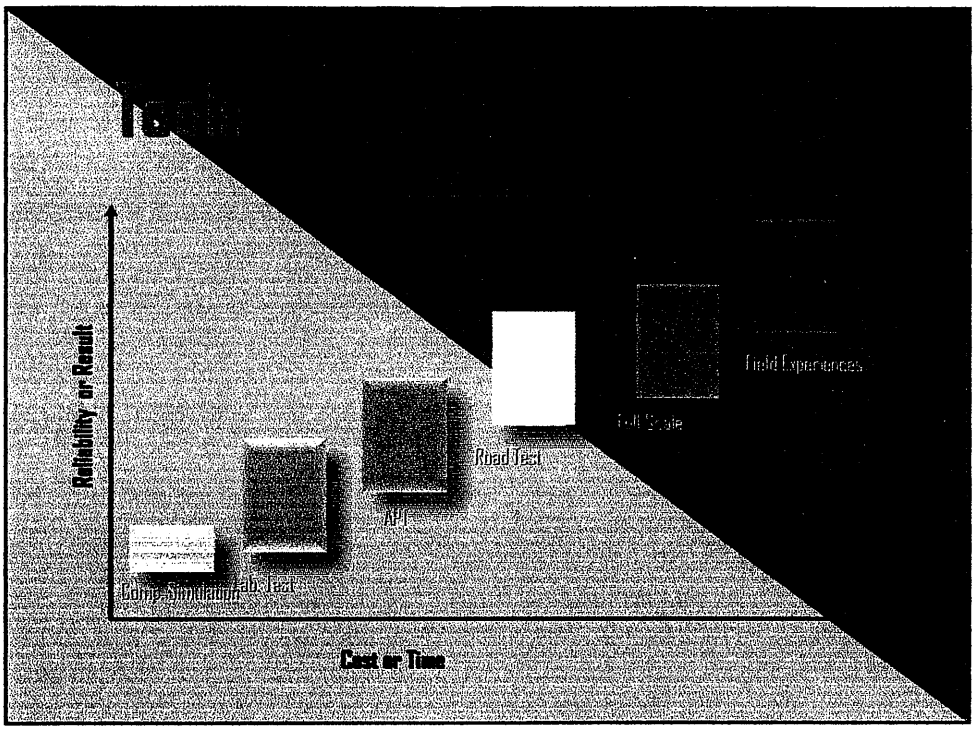
No.	R & D Focus	Funds (in milion rupiahs)
1.	Environmental friendly road	10.700
2.	Tunnel	33.106
3.	Urban road	11.236
4.	Mitigation and adaption on climate change	1.675
5.	Strategic pavement (natural Buton asphalt, flexible pavement, rigid pavement)	62.167
6.	Soil stabilization	41.011
7.	Long-span bridge	7.586
8.	Bridge maintenance	23.820
9.	ITS	4.403

Mid-term R & D Projected Funding (2)

No.	R & D Focus	Funds (in milion rupiahs)
1.	Road safety	8.896
2.	Trans ASEAN and Asia Highway	2.517
3.	Indonesia Highaway Capacity Manual	2.548
4.	Low volume road	3.986
5.	Local material	25.000
6.	Mitigation on slope disaster	17.081

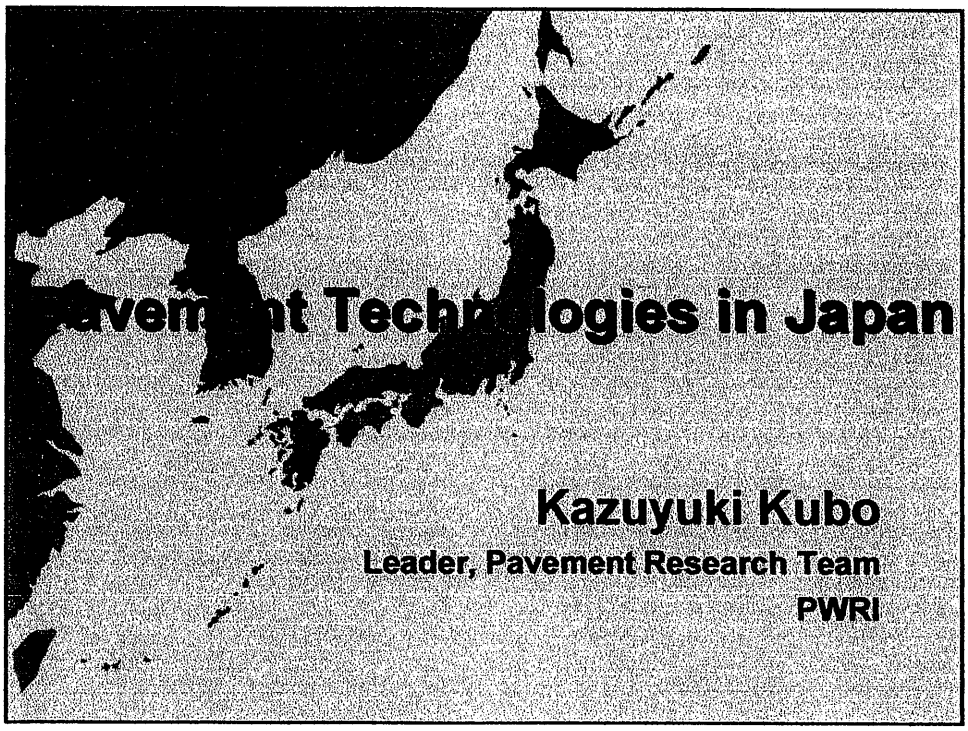

R&D Mechanism
R,D,E & O Strategic Management
Government R,D & E Strategy
Technological foresight & Forecasting
Long-term Strategic planning
Working system

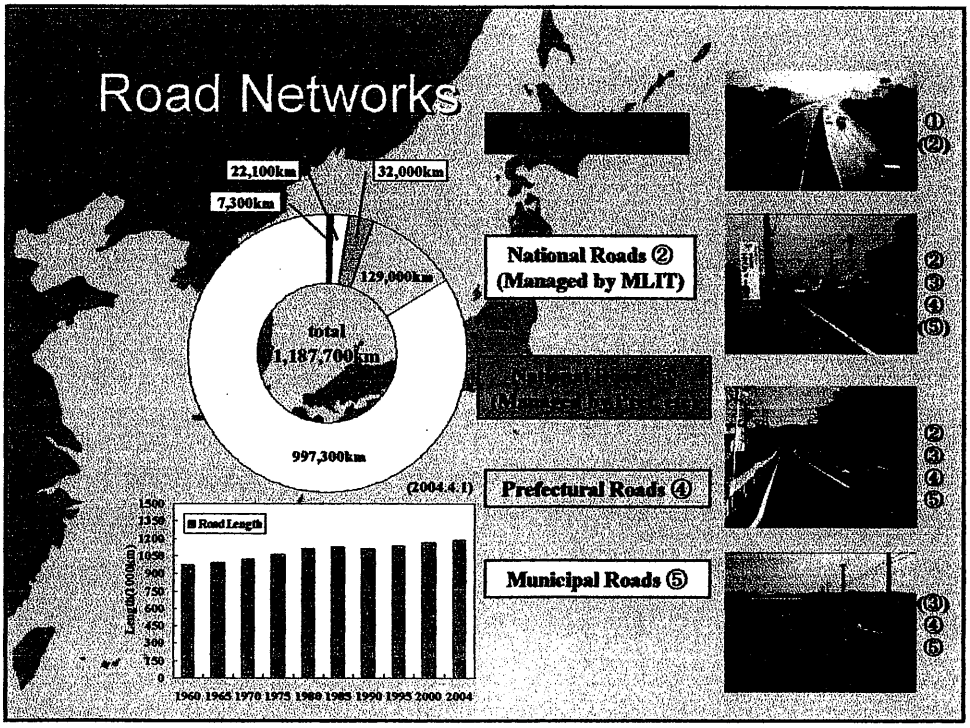

Process
Find information, data, or explanation to prove a claim of truth based on hypothesis related to sains and technology subject
Develop mechanism and theory which is proved to be true to increase product innovation
Engineering
(Act No. 18 , 2002 , National System of Research and Development, and Science and Technolog
Implementation)

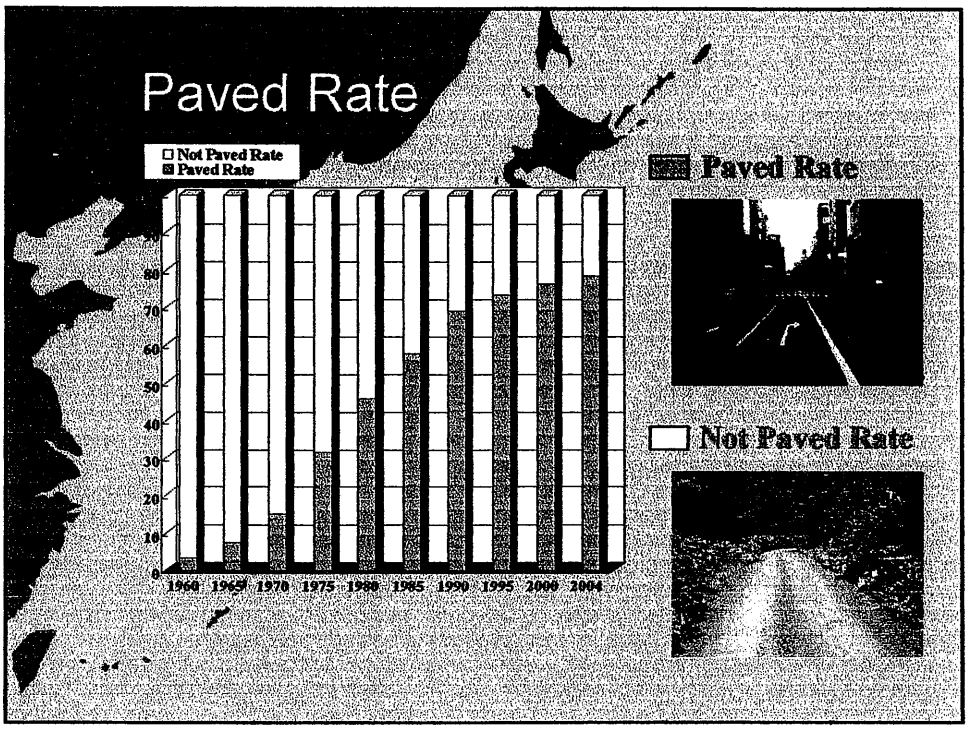

Reliability or Result
Cost or Time
Field Experiences
Full Scale
Road Test
APT
Lab. Test
Comp. Simulation

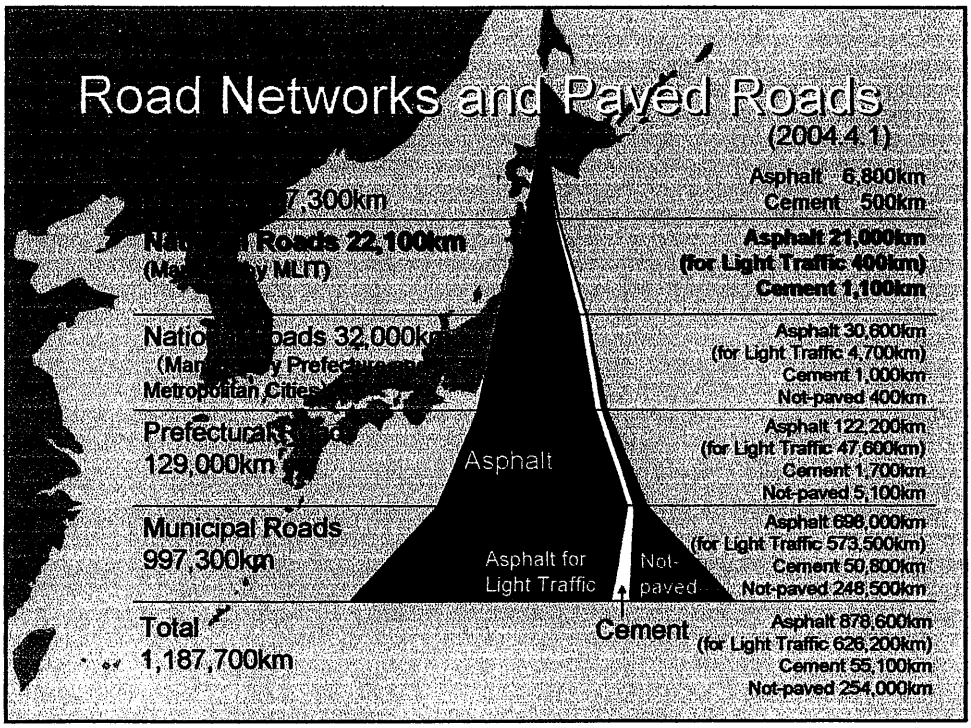

THANK YOU

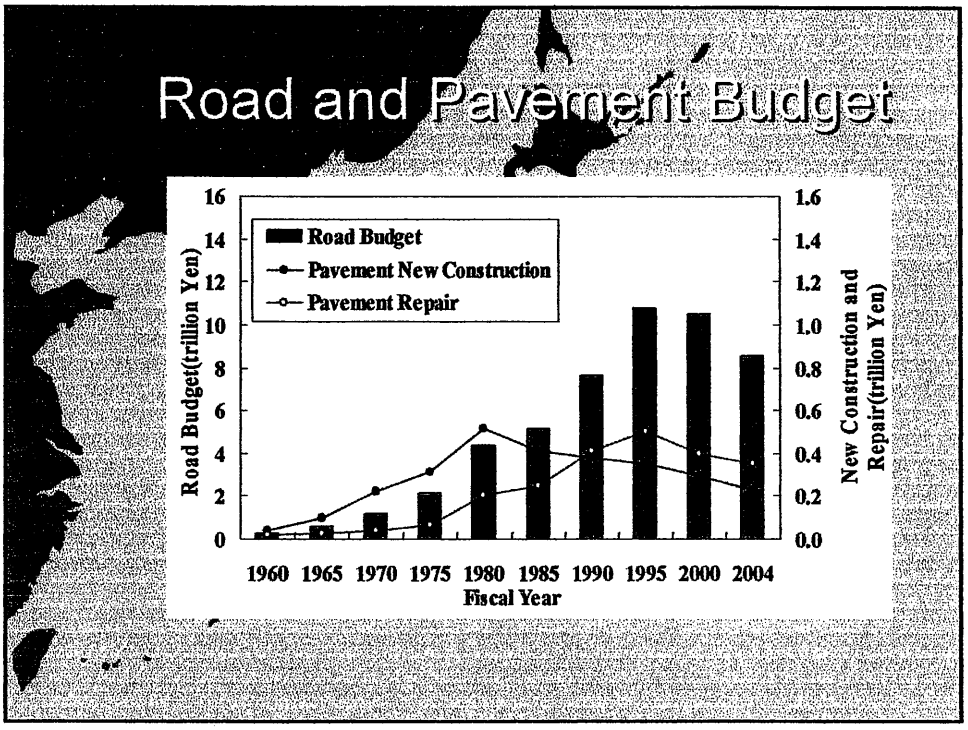
Technical Session I
PAVEMENT AND EXPRESSWAY

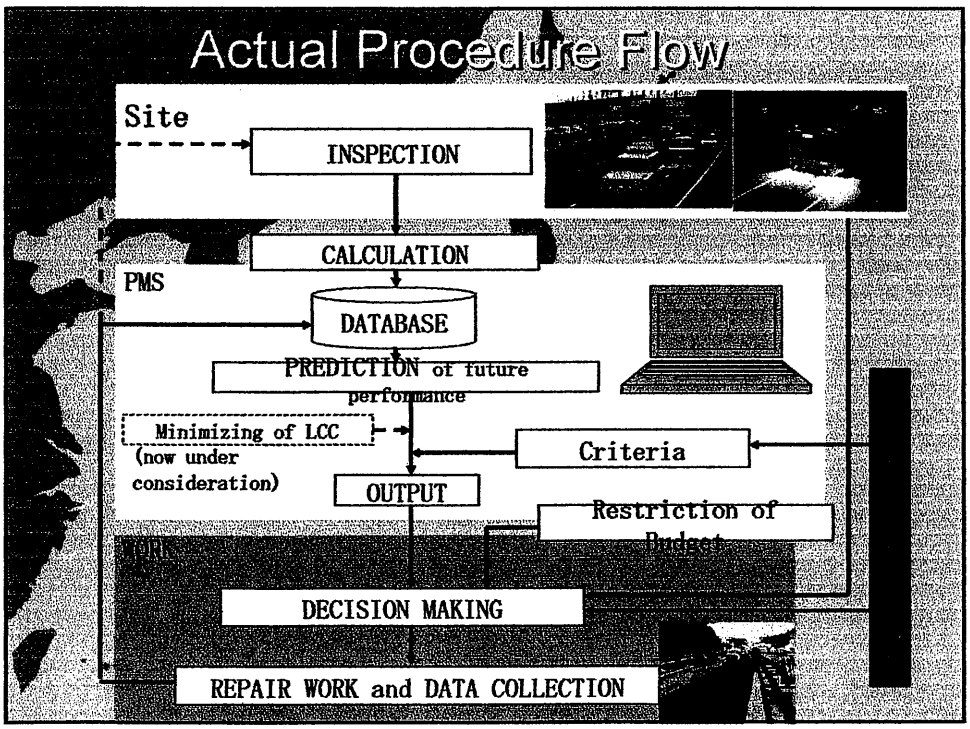

Kazuyuki Kubo
Leader, Pavement Research Team
PWRI

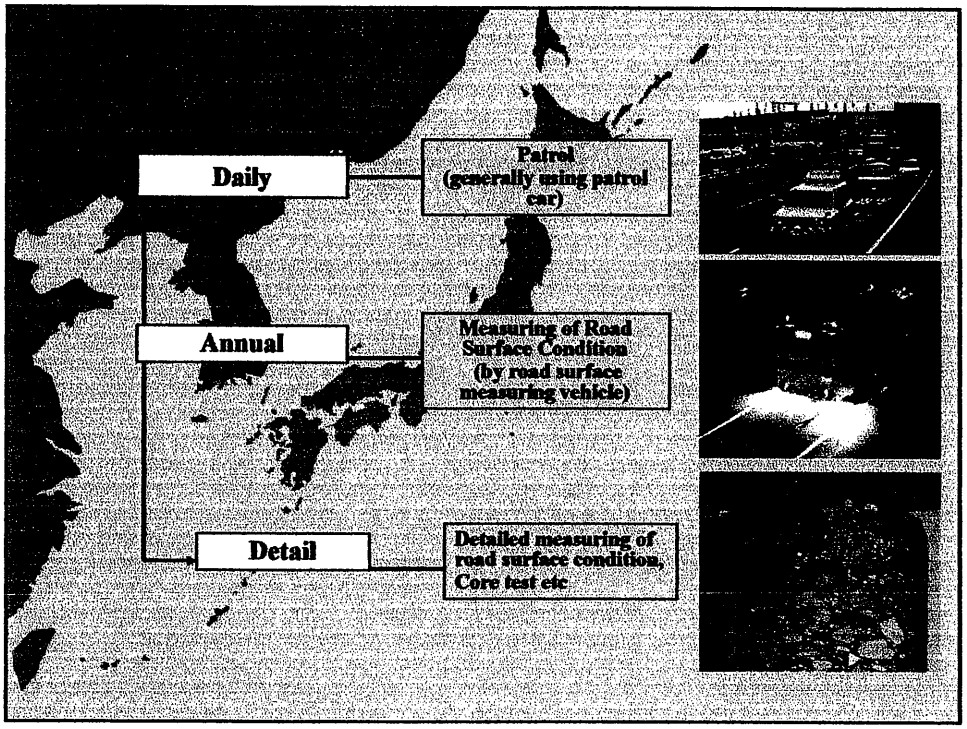

Road Networks
22,100km
32,000km
7,300km
129,000km
total
1,187,700km
997,300km
(2004.4.1)
National Roads ②
(Managed by MLIT)
Prefectural Roads ④
Municipal Roads ⑤
Road Length
1960 1965 1970 1975 1980 1985 1990 1995 2000 2004

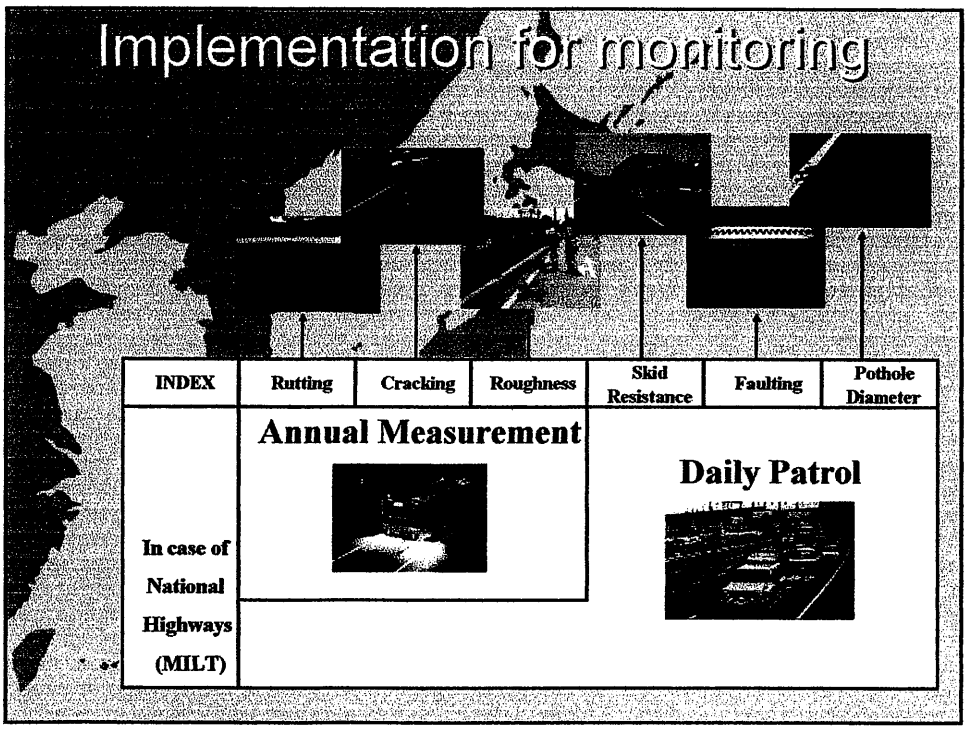

Paved Rate
Not Paved Rate
Paved Rate
0
10
20
30
40
50
60
70
80
90
1960 1965 1970 1975 1980 1985 1990 1995 2000 2004
Paved Rate
Not Paved Rate

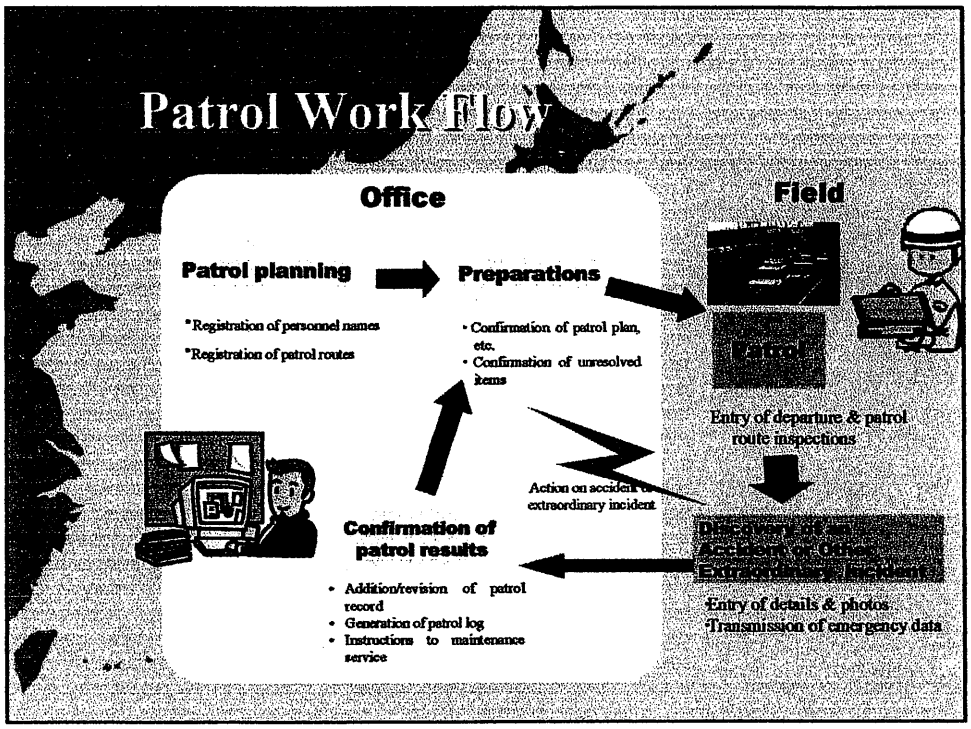

Road Networks and Paved Roads
(2004.4.1)
7,300km
Asphalt 6,800km
Cement 500km
Roads 22,100km
Asphalt 21,000km
(for Light Traffic 400km)
Cement 1,100km
oads 32,000km
Asphalt 30,600km
(for Light Traffic 4,700km)
Cement 1,000km
Not-paved 400km
Prefectural
129,000km
Asphalt 122,200km
(for Light Traffic 47,600km)
Cement 1,700km
Not-paved 5,100km
Municipal Roads
997,300km
Asphalt 698,000km
(for Light Traffic 573,500km)
Cement 50,800km
Not-paved 248,500km
Total
1,187,700km
Asphalt
Asphalt for Light Traffic
Not-paved
Cement
Asphalt 878,600km
(for Light Traffic 626,200km)
Cement 55,100km
Not-paved 254,000km

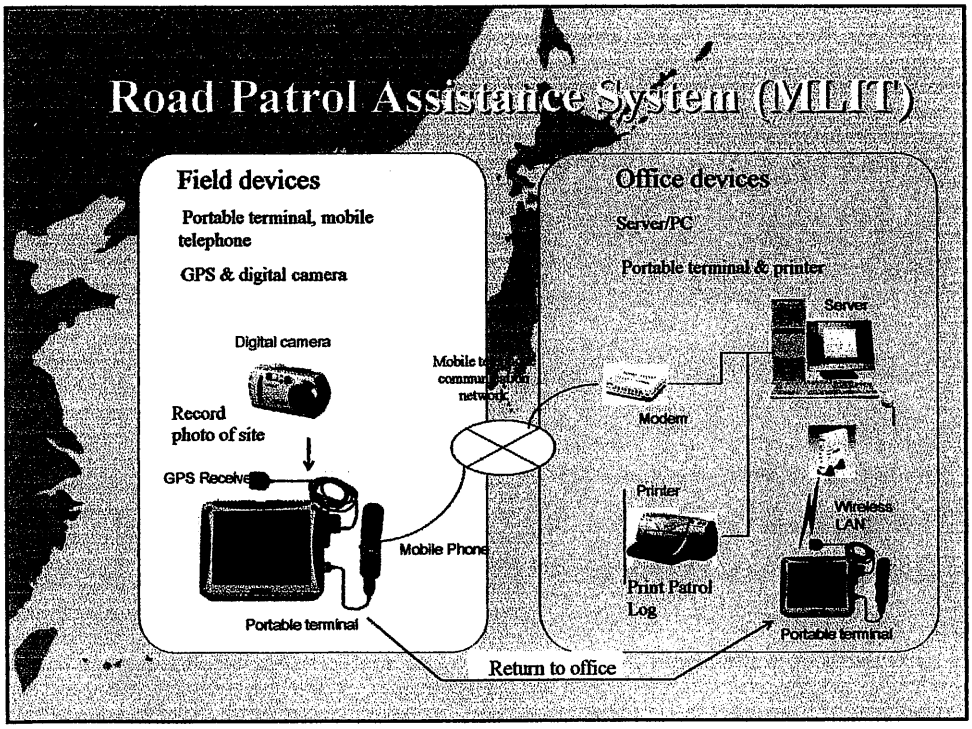

Road and Pavement Budget
Road Budget
Pavement New Construction
Pavement Repair
Road Budget(trillion Yen)
New Construction and Repair(trillion Yen)
16
14
12
10
8
6
4
2
0
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1960 1965 1970 1975 1980 1985 1990 1995 2000 2004
Fiscal Year


Actual Procedure Flow
Site
INSPECTION
CALCULATION
PMS
DATABASE
PREDICTION of future performance
Minimizing of LCC
(now under consideration)
Criteria
OUTPUT
Restriction of Budget
DECISION MAKING
REPAIR WORK and DATA COLLECTION


Daily
Patrol
(generally using patrol car)
Annual
Measuring of Road Surface Condition
(by road surface measuring vehicle)
Detail
Detailed measuring of road surface condition, Core test etc


Implementation for monitoring
INDEX
Rutting
Cracking
Roughness
Skid Resistance
Faulting
Pothole Diameter
In case of National Highways (MILT)
Annual Measurement
Daily Patrol


Patrol Work Flow
Office
Field
Patrol planning
Preparations
*Registration of personnel names
*Registration of patrol routes
• Confirmation of patrol plan, etc.
• Confirmation of unresolved items
Patrol
Entry of departure & patrol route inspections
Action on accident or extraordinary incident
Confirmation of patrol results
• Addition/revision of patrol record
• Generation of patrol log
• Instructions to maintenance service
Entry of details & photos
*Transmission of emergency data

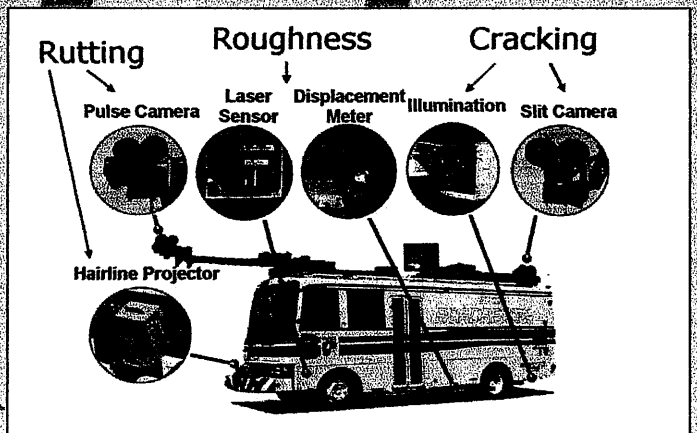

Road Patrol Assistance System (MLIT)
Field devices
Portable terminal, mobile telephone
GPS & digital camera
Digital camera
Record photo of site
GPS Receiver
Mobile Phone
Portable terminal
Office devices
Server/PC
Portable terminal & printer
Server
Modem
Printer
Print Patrol Log
Wireless LAN
Portable terminal
Return to office

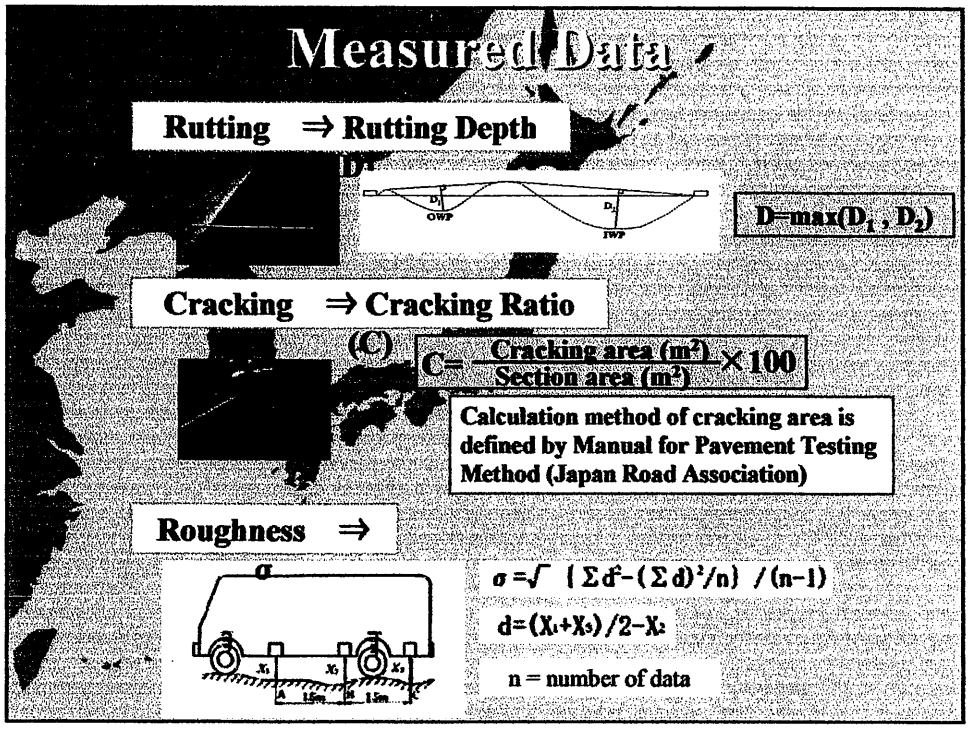
Annual Measurement

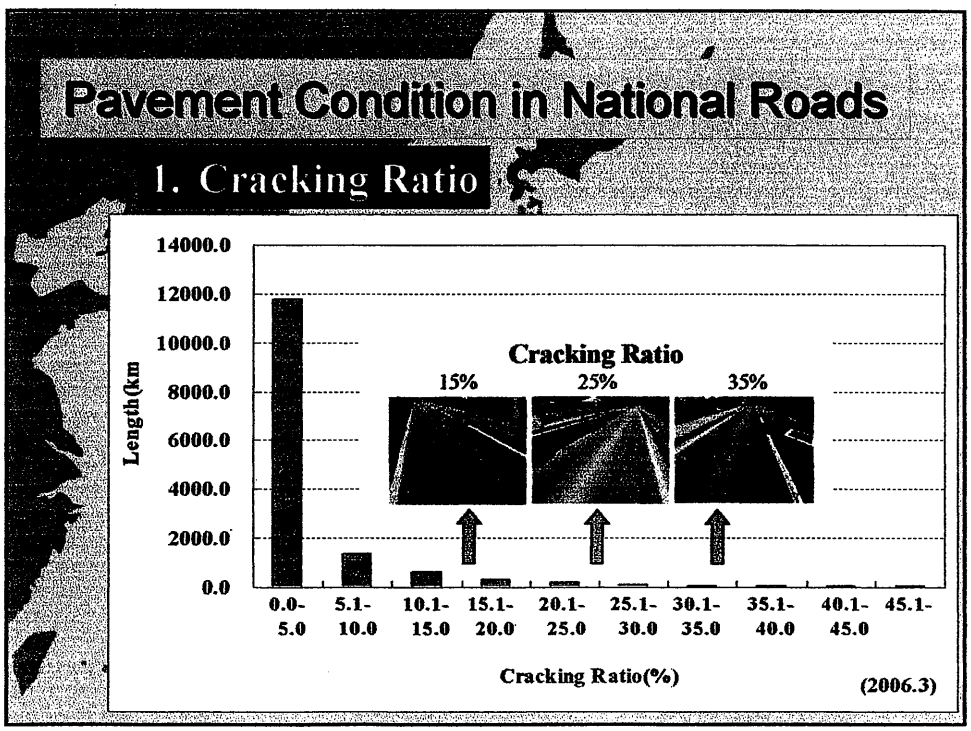
- Monitoring length (Annually implemented)
  about 7,[illegible]km/ a year
  → whole network is measured every 3 year

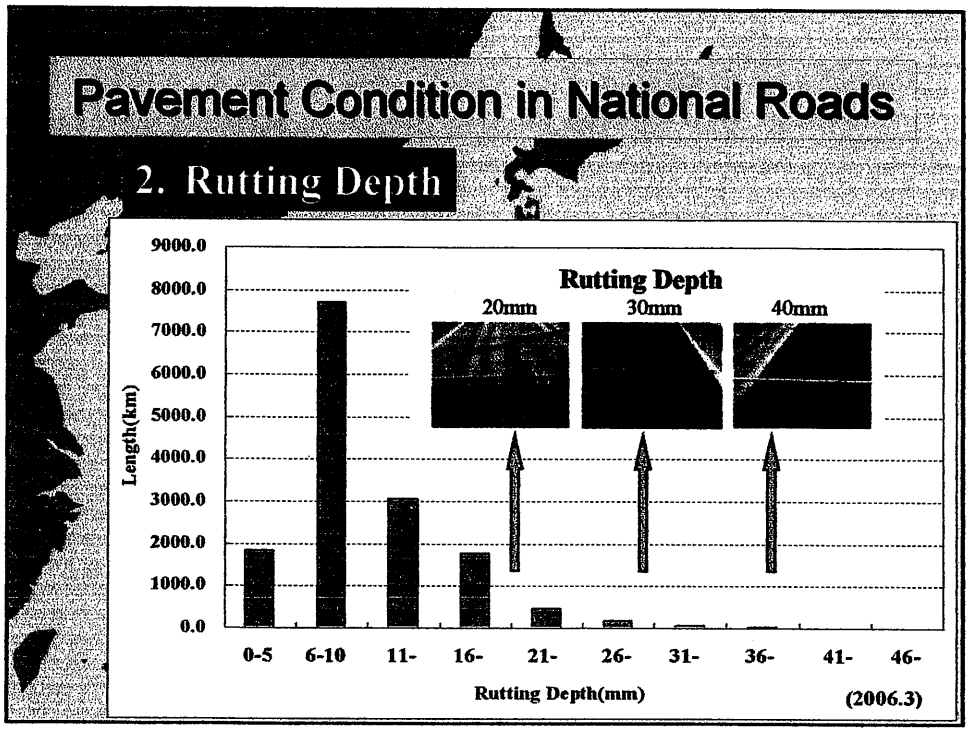
- Road Surface Measuring Devices
- Items Measured
  - *Cracking Ratio
  - *Rutting Depth
  - *Roughness

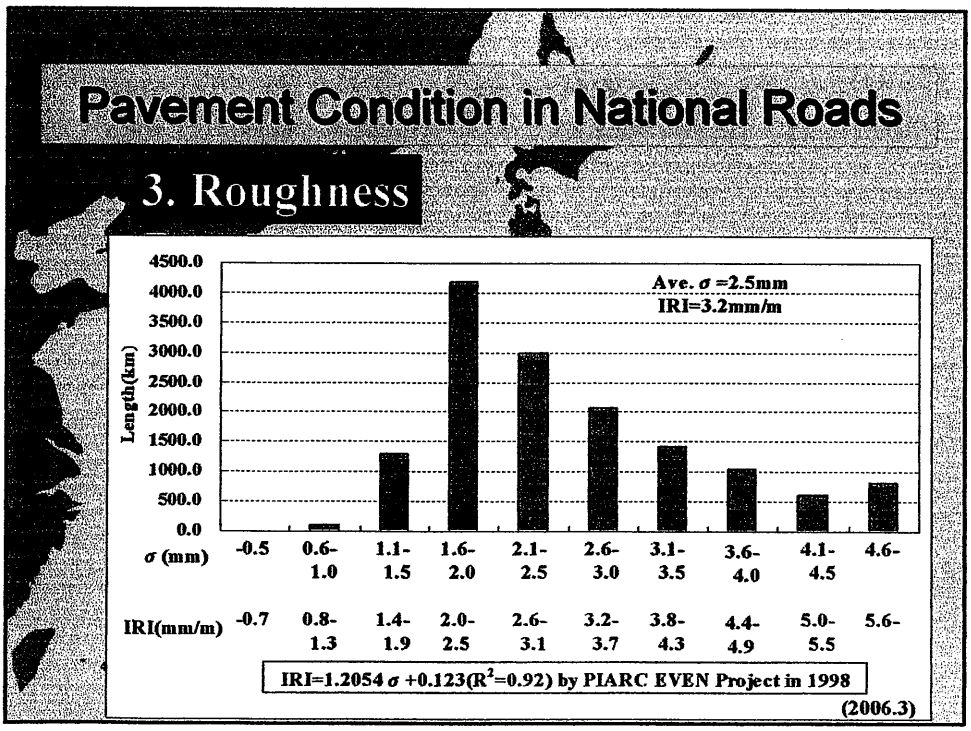
■ Road Surface Measuring Device (1)

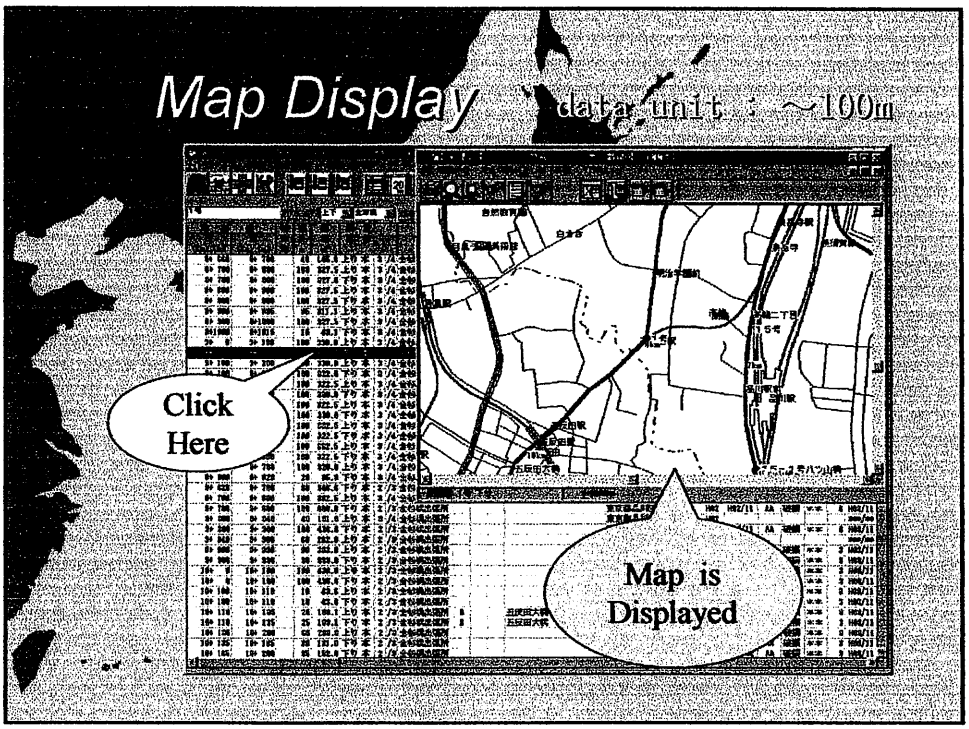


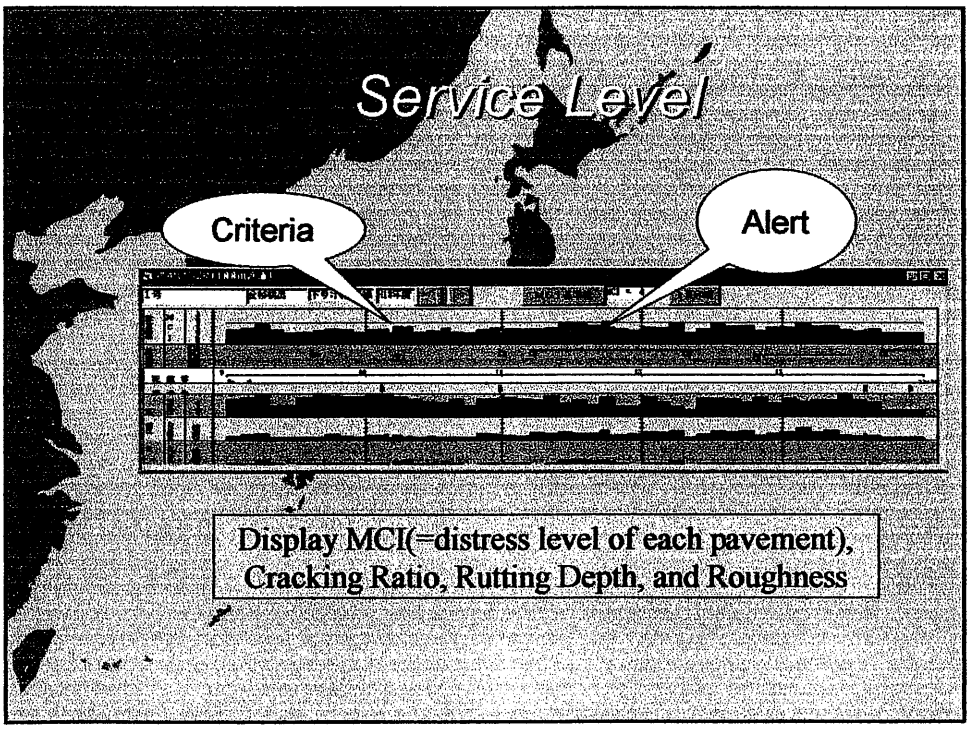

Measured Data
Rutting ⇒ Rutting Depth
D=max(D1 , D2)
Cracking ⇒ Cracking Ratio
C= Cracking area (m²) / Section area (m²) ×100
Calculation method of cracking area is defined by Manual for Pavement Testing Method (Japan Road Association)
Roughness ⇒
σ =√ {Σd²-(Σd)²/n} /(n-1)
d=(X1+X3)/2-X2
n = number of data

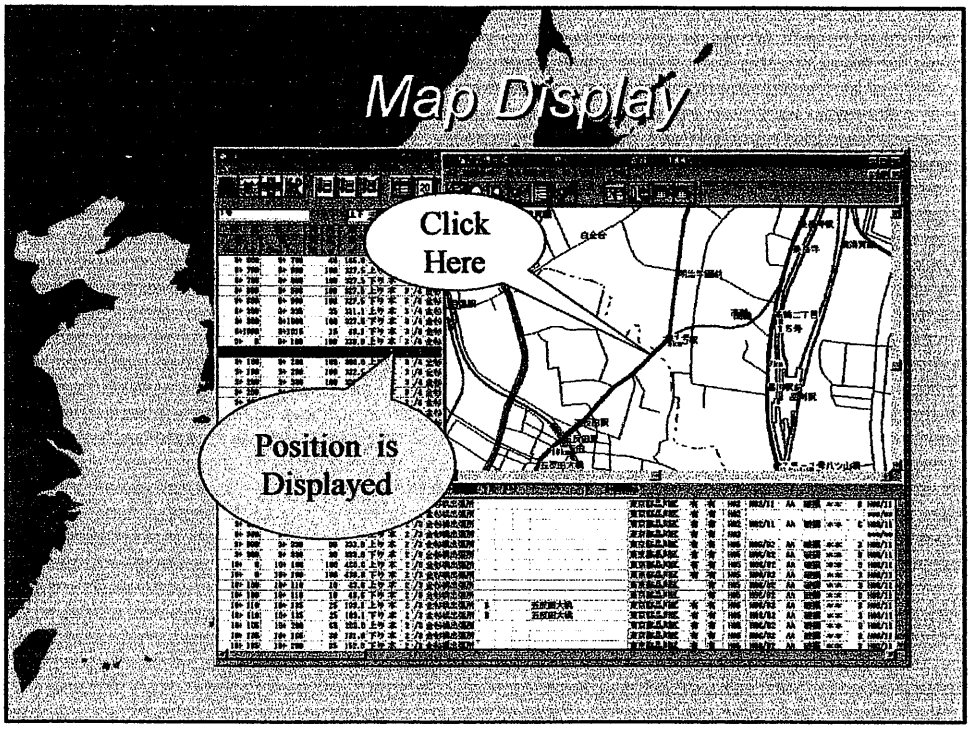

Pavement Condition in National Roads
1. Cracking Ratio
Length(km
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
Cracking Ratio
15%
25%
35%
0.0-5.0
5.1-10.0
10.1-15.0
15.1-20.0
20.1-25.0
25.1-30.0
30.1-35.0
35.1-40.0
40.1-45.0
Cracking Ratio(%)
(2006.3)

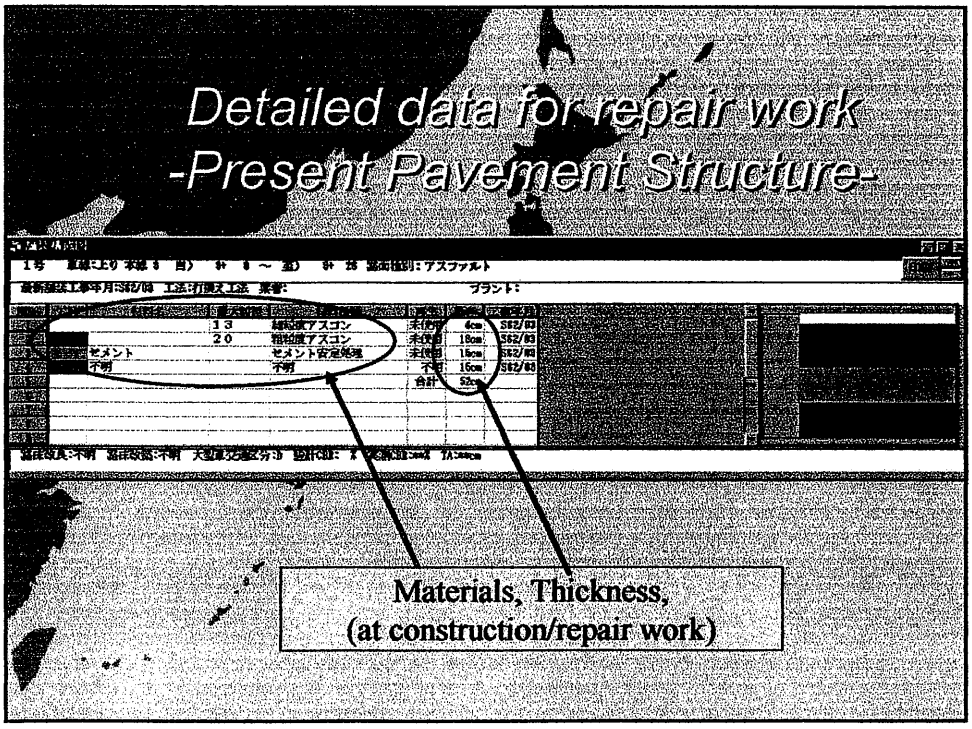

Pavement Condition in National Roads
2. Rutting Depth
Rutting Depth
20mm
30mm
40mm
Length(km)
9000.0
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
0-5
6-10
11-
16-
21-
26-
31-
36-
41-
46-
Rutting Depth(mm)
(2006.3)

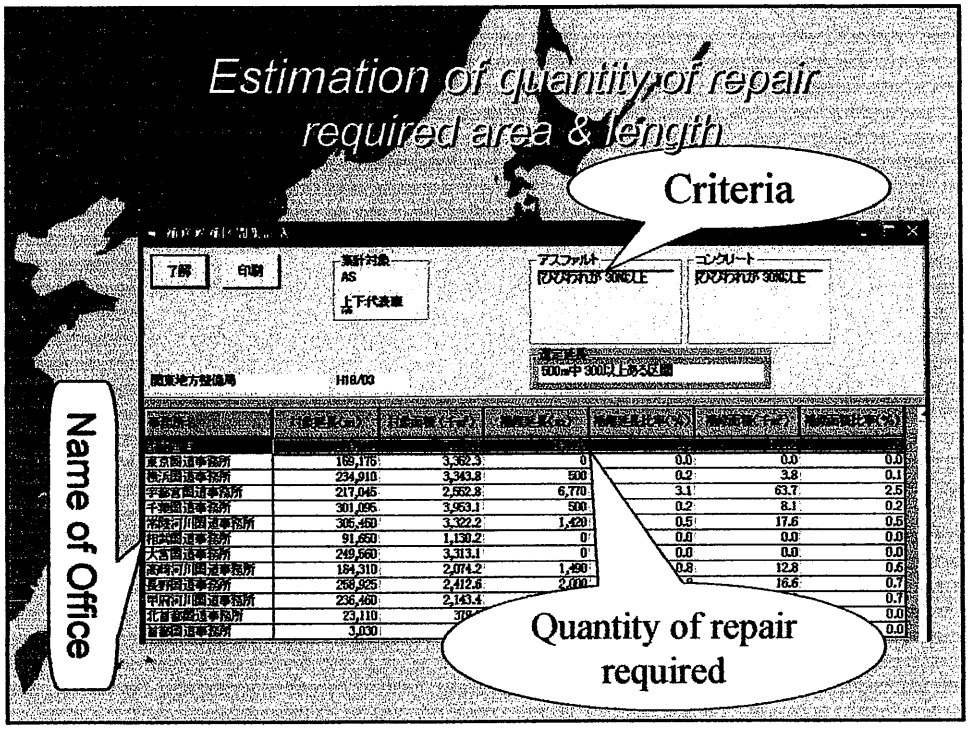

Pavement Condition in National Roads
3. Roughness
Ave. σ =2.5mm
IRI=3.2mm/m
Length(km)
4500.0
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
σ (mm)
-0.5
0.6-1.0
1.1-1.5
1.6-2.0
2.1-2.5
2.6-3.0
3.1-3.5
3.6-4.0
4.1-4.5
4.6-
IRI(mm/m)
-0.7
0.8-1.3
1.4-1.9
2.0-2.5
2.6-3.1
3.2-3.7
3.8-4.3
4.4-4.9
5.0-5.5
5.6-
IRI=1.2054 σ +0.123(R²=0.92) by PIARC EVEN Project in 1998
(2006.3)

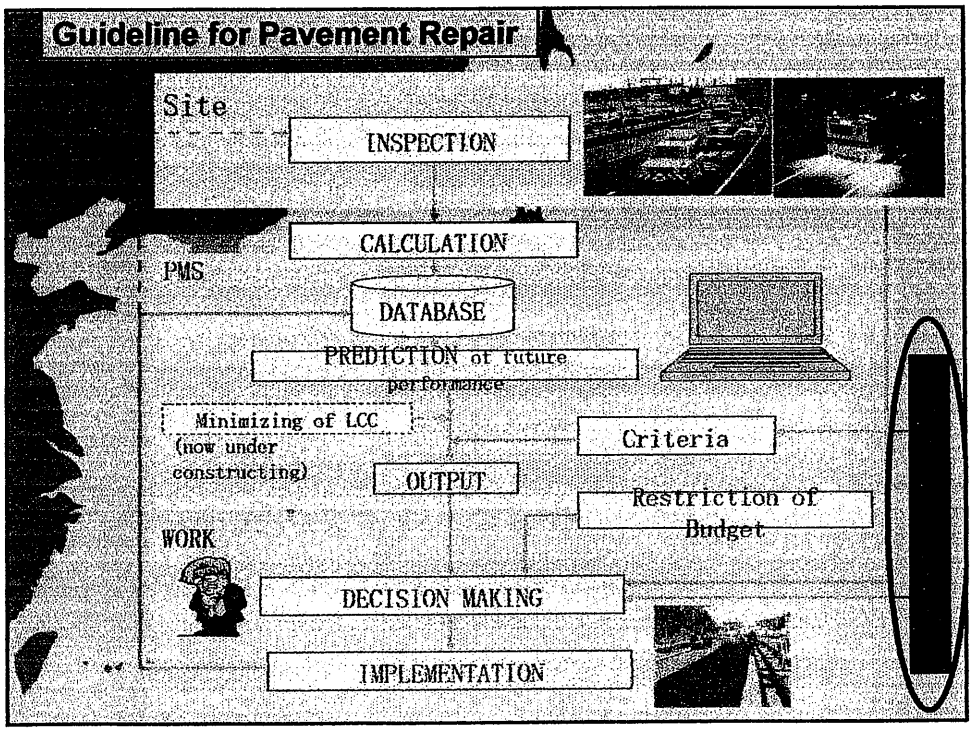

Map Display
data unit : ~100m
Click Here
Map is Displayed

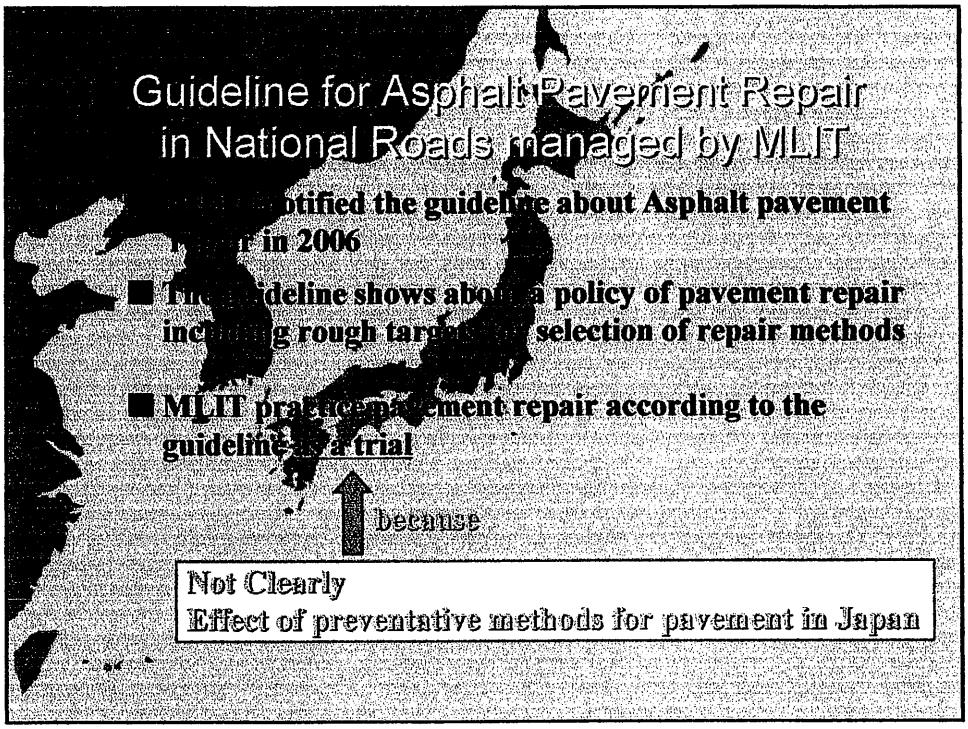

Service Level
Criteria
Alert
Display MCI(=distress level of each pavement), Cracking Ratio, Rutting Depth, and Roughness

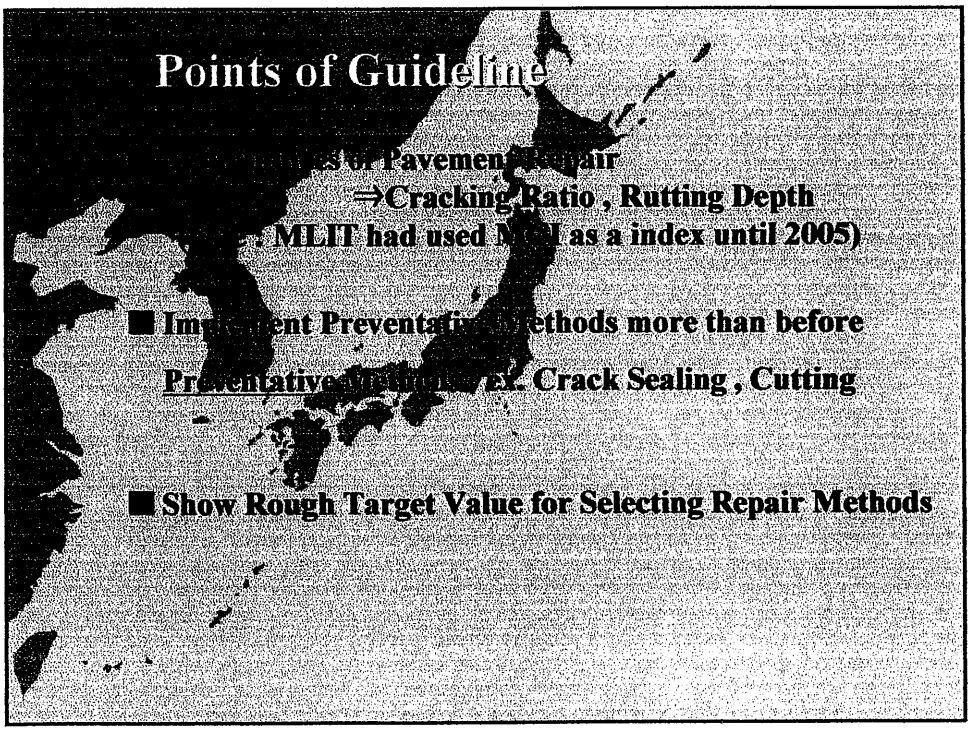

Map Display
Click Here
Position is Displayed


Detailed data for repair work
-Present Pavement Structure-
Materials, Thickness,
(at construction/repair work)


Estimation of quantity of repair
required area & length
Criteria
Name of Office
Quantity of repair required


Guideline for Pavement Repair
Site
INSPECTION
CALCULATION
PMS
DATABASE
PREDICTION of future performance
Minimizing of LCC
(now under constructing)
Criteria
OUTPUT
Restriction of Budget
WORK
DECISION MAKING
IMPLEMENTATION


Guideline for Asphalt Pavement Repair
in National Roads managed by MLIT
■ MLIT practice pavement repair according to the guideline as a trial
because
Not Clearly
Effect of preventative methods for pavement in Japan


Points of Guideline
⇒Cracking Ratio , Rutting Depth
■ Show Rough Target Value for Selecting Repair Methods

MCI (Maintenance Control Index)

$MCI = 10 - 1.48C^{0.3} - 0.29D^{0.7} - 0.47\sigma^{0.2}$

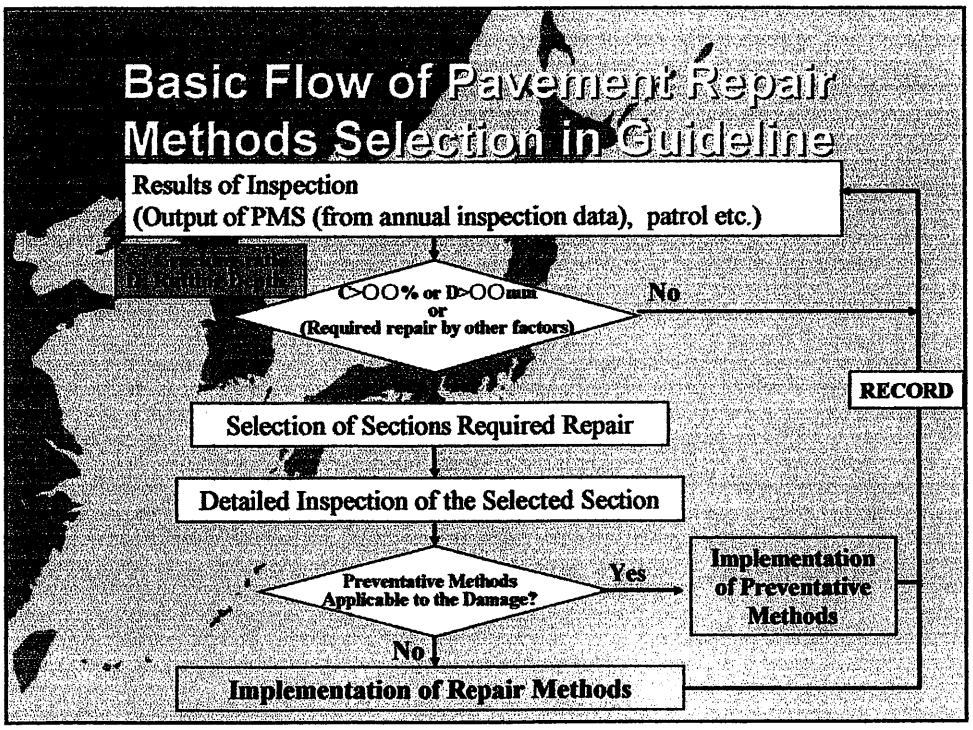
C: Cracking Ratio

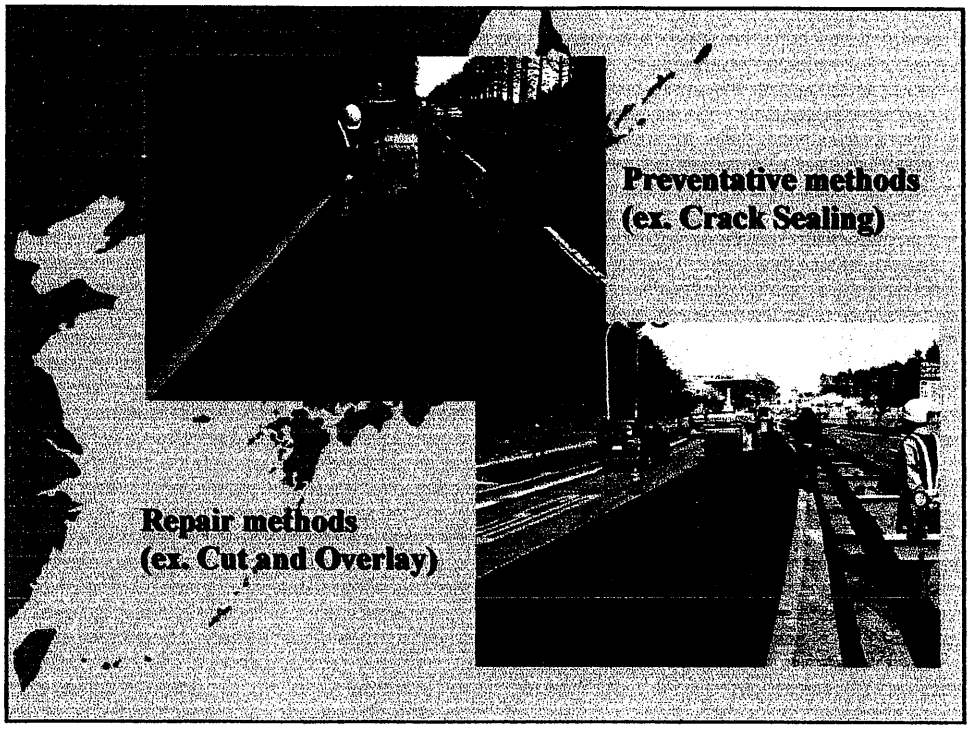
D: Rutting Depth (mm)

σ: Roughness (mm)

- Fullmark=10points
- MCI had been used by MLIT as a Index of the pavement management until 2005
- At present , MLIT uses Cracking Ratio and Rutting Depth as the important Indices for judgment of repair pavement

Basic Flow of Pavement Repair Methods Selection in Guideline





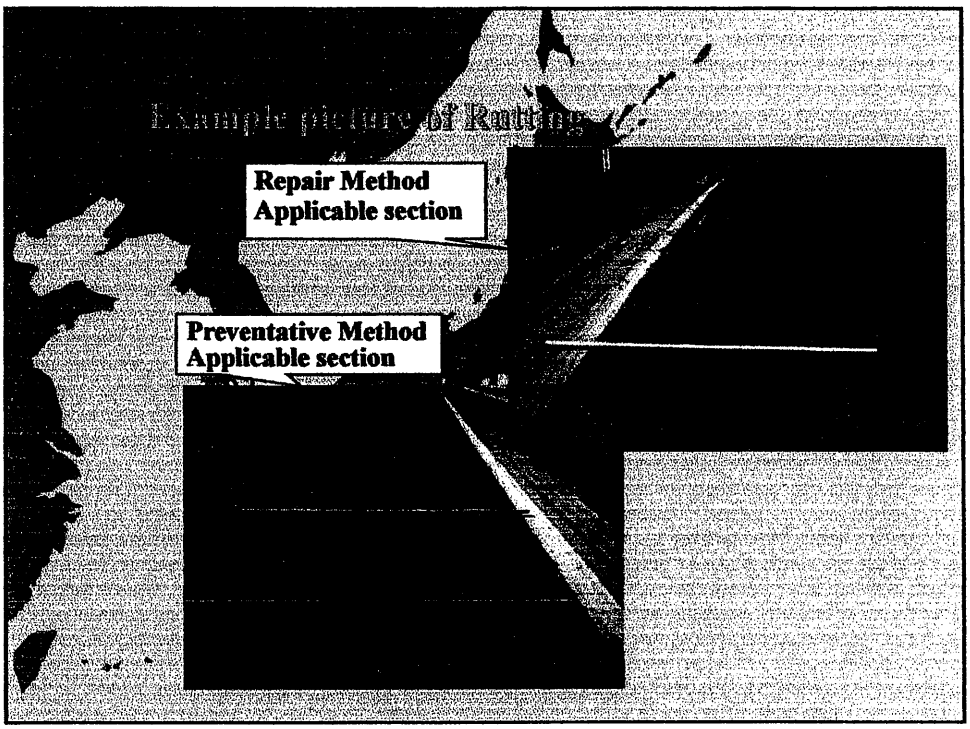
Rough Target (Selection of Method)

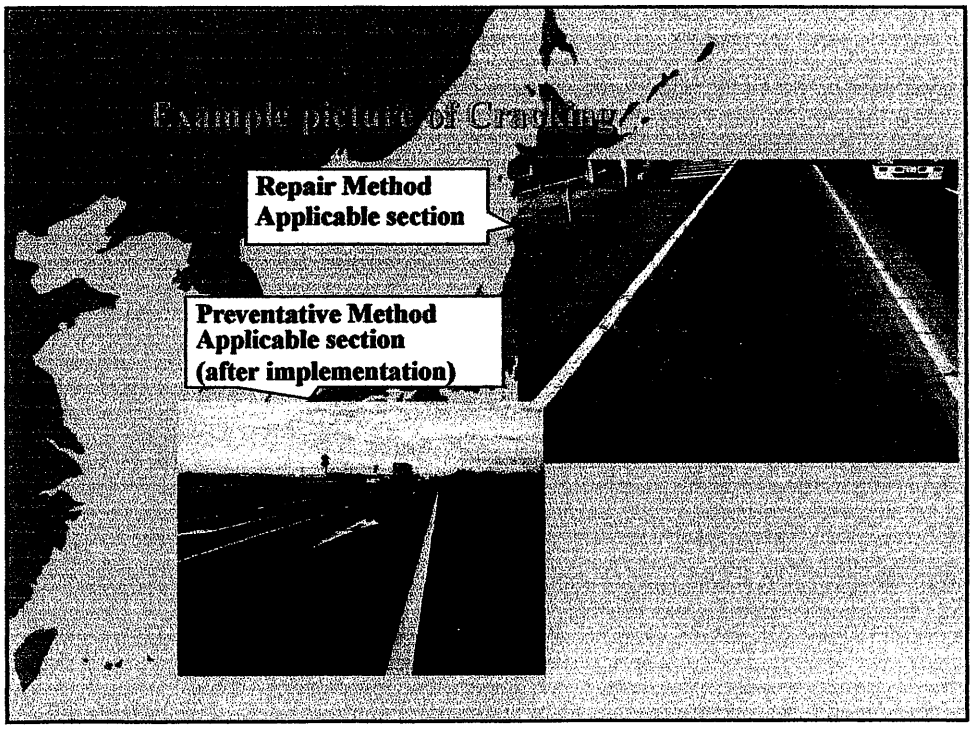
Cracking Ratio \ Rutting Depth	0mm-10mm	10mm-20mm	20mm-30mm	30mm-40mm	35mm-40mm	40mm-
0%-10%				cutting		
10%-20%						
20%-30%						
30%-35%	Crack sealing		Crack sealing + cutting			
35%-40%						
40%-	repair method(cut and overlay,etc)					

Preventative methods

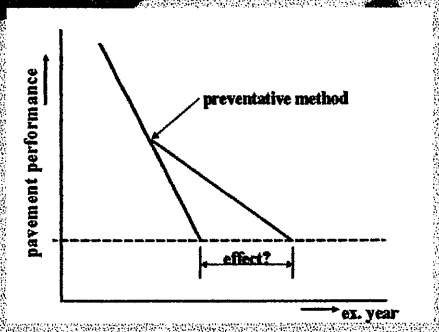
Notice : The guideline shows these rough targets

but the guideline also says "technical judgment of engineer is important for selecting repair method properly"

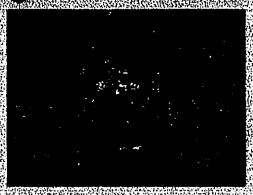

Example picture of Rutting
Repair Method
Applicable section
Preventative Method
Applicable section


Example picture of Cracking
Repair Method
Applicable section
Preventative Method
Applicable section
(after implementation)

Review of Guideline



duration of material performance?



☺ In future , MLIT will review the guideline if necessary

Thank you for your attention !

Indonesian Pavement Research Strategy

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Indonesia is the world's largest island group, it comprises over 3,000 islands situated below the equator which passes the center of Sumatera , Kalimantan and through the central Sulawesi. Therefore, it has a tropical climate which is greatly influenced by mountains and the sea. The total length of Indonesian roads is 372.173 km consisting of national, provincial, toll and district roads with the length of 34.629 km, 48.681 km, 688 km and 288.185 km respectively. While the length of country road is 240.000 km spreaded in the whole country.

The type of pavement used , 47% of the total length is asphalt and concrete pavements and the rest (53%) is unpaved road. From all paved roads, 98% is asphalt pavement while concrete road is only 2%. The reason is that asphalt pavement has been applied for a long time, while concrete road was just applied in 1985 and continuously developing. Budget for road construction and maintenance is approximately 1/3 and 1/5 of total needs, as a consequence, most roads are in bad condition. Furthermore, overloading with its load equivalent factor ranges from 2-5 times of permitted loads equivalent factor leads to early damage. In the future, national road is designed to use the maximum axle loads of 10 tonnes, 2 tonnes greater than the present condition (8 tonnes). The performance of pavement, especially asphalt pavement will be much influenced by Indonesian geographic and climate which tends to increase in temperature resulting from global warming. In addition, Indonesia with large areas has different regional characteristics including geographical condition and availability of material types and quality such as aggregate and sand. In certain areas, it is difficult to find aggregate for road pavement, it must be transported from other islands.

Asphalt is the main material for road pavement. Indonesia needs 1,3 million tonnes, however, local asphalt product is approximately 600.000 tonnes, the rest has to be imported from other countries. On the other hand, Indonesia has a large deposit of natural rock asphalt (Asbuton) reaching of 670 m tonnes which has not been optimally utilized. The reasons are Asbuton has different properties and Asbuton production is low in quality.

Cement factories in Indonesia have total production capacity by 44.89 m tonnes/year, however, domestic consumption is 34.17 m tonnes which most consumed by property (housing) sector, so that the rest of cement production capacity can be utilized by road sector. Approximately, 124.000 km of Indonesian roads are unpaved and most of them are low volume roads mainly in Kalimantan, Sulawesi and Papua, up to present there is no standard specification is made. Nowadays, environmental concern is developing therefore, environmental pavement technology is required. The reliability of infrastructure system which can increase competitive economic growth is one of the main goals of Indonesian Ministry of Public Works, therefore, pavement technology

suitable for Indonesian condition is needed. Road Map Research Design has been prepared consisting of four divisions, namely road map technology for Indonesia Natural Rock Asphalt (Asbuton) utilization, Road map technology for rigid pavement, Road map technology for flexible pavement and Road map technology for low volume roads. Road map technology for Indonesia Natural Rock Asphalt (Asbuton) is focused on utilization of Indonesian natural rock asphalt (Asbuton) in order to be utilized to overcome the shortage of asphalt in Indonesia. It is implemented by conducting several studies on database of Asbuton deposit and properties, Asbuton rheological properties, technology of Asbuton mix design, and economic feasibility study of Asbuton and its supply.
Road map for rigid pavement is aimed to provide technology of concrete utilization which is expected to decrease the need of asphalt, utilize the potential of cement production, overcome traffic overloading problem and also participate in nature preservation. The main focus of road map technology for rigid pavement is material technology and concrete mix design, design of concrete pavement for low volume traffic and heavy traffic, maintenance technology for concrete road and concrete pavement construction technology. Road map of Flexible pavement is focused on pavement technology to anticipate the increase of vehicle load, flexible pavement technology suited for Indonesian condition, technology for utilization of local materials and environmental technology to save energy. Road map of flexible pavement is categorized to be four groups ,i.e: material and asphalt mix, thickness design of flexible pavement, method of construction for flexible pavement, maintenance technology for flexible pavement and pavement management.
Road map technology for low volume traffic is aimed to provide relevant of low cost technology for low volume traffic by considering the availability and quality of local materials through several research which producing technical manuals for pavement mix design of low volume traffic, manuals for construction and supervision. Another one is study on sub standard local materials for road pavement materials.
The four road maps above, are expected to realize "the relevant road pavement technology for heavy and low volume traffic suitable for Indonesian condition, by utilizing natural material (mainly natural rock asphalt and cement), which durable, comfortable and safe for environment.

Keywords: flexible pavement, concrete pavement, Indonesian natural rock asphalt, low volume traffic, road map, environmental preservation, over loading.

PAVEMENT CONDITION POST DISASTER

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Abstract

With the complex geological structure, Indonesia is prone to serious disasters, such as : earthquakes and volcanic eruption which damage infrastructures in a short period of time and, moreover, the second phenomena, such as tsunamis and land slide. In recent years disaster caused by earthquake were occured in many place of Indonesia, such as Tsunamis in Aceh on the morning of December 26, 2004, and Indian Ocean earthquake near Padang on September 30, 2009, which measured 7,6 on the Richter scale.

Much of the primary transportation infrastructure of West Sumatera province especially in Padang and Pariaman areas, was damages. Typical damages on the road pavement such as landslide, settlement and craks. Measures should be taken to repaired roads and bridges. Damages road pavement was repaired such as remove soil and install caution signs, crack shall be sealed immediately, sand bags or gabion installment, and divert water flow and construct temporary drains. There was a great danger that heavy rain would result in secondary disaster such as landslides. Measures for prevention to landslide or slope failure : close the areas where there was fear of damage, making temporary drainage to protect the landslides area from water flow, and strengthened inspection.

The next steps is rehabilitation and reconstruction. In this step it is needed to select the construction with the most effective and economical landslide treatment, other factors must be considered, including safety, construction scheduling, availability of materials, site accessibility, equipment availability, aesthetics, budget for design and construction, and environmental impact.

Key words : disaster, pavement

1. INTRODUCTION

Indonesia is the world's largest archipelago (Area : 1,922,570 km2), this country consists of many island for more than 17,000 islands spread from 6°08' north latitude to 11°15' south latitude, and from 94°45' to 141°05' east longitude. Indonesian region lie at the intersection of three major lithospheric plates : Eurasian, Pacific and Indian-Australian plate. Pacific plate has been continuously moving northwest and Indian-Australian plate moving northword, where oceanic crust of the Indian plate underthrusts the asian plate. With the complex geological structure, Indonesia is prone to serious disasters, such as : earthquakes and volcanic eruption which damage infrastructures in a short period of time and, moreover, the second phenomena, such as tsunamis and land slide.

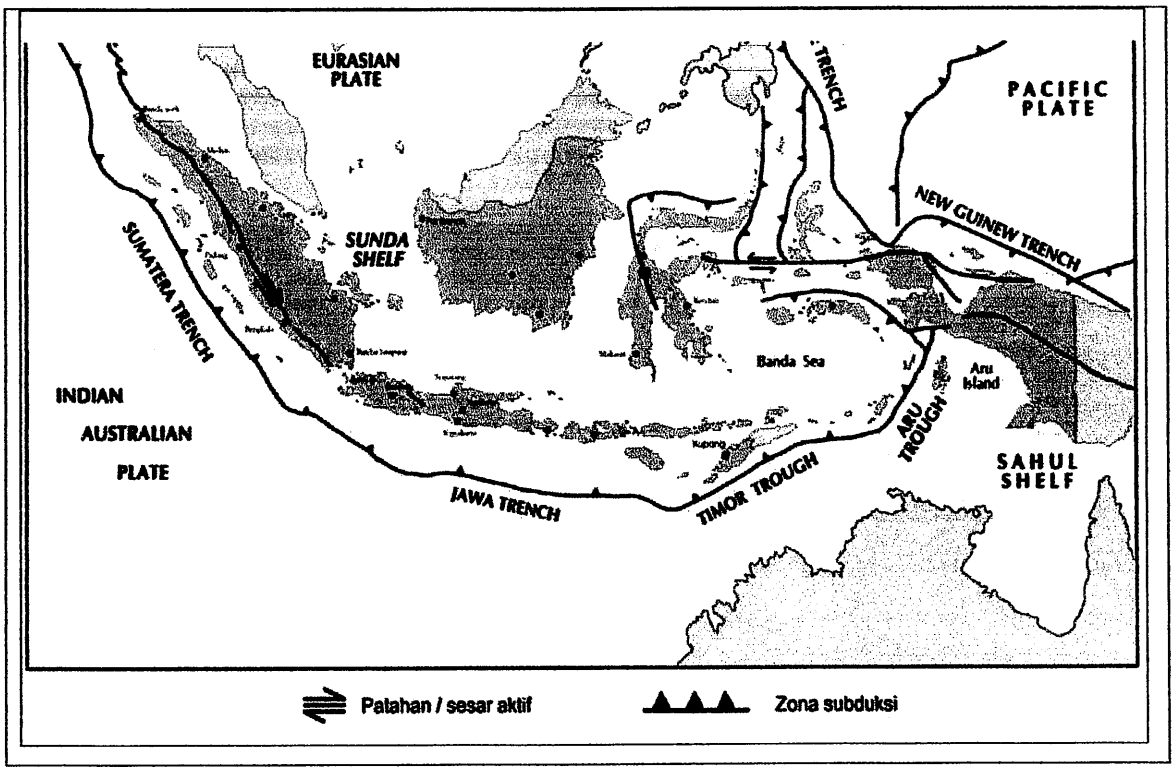

Figure 1. Plates and subduction zone in Indonesia

In recent years disaster caused by earthquake were occured in many place of Indonesia, such as : Flores sea on December 12, 1992 (Magnitudes=7,5), Lampung on February 16, 1994 (Magnitudes=7,2), Banyuwangi on Juny 3, 1994, Bengkulu on Juny 4, 2000, Alor Island on October 24 and November 15 (Magnitudes=7,3),

Nabire on February 6 (Ms=6,9) and November 26, 2004 (Ms=6,4) which have caused heavily damaged. Tsunamis in Aceh on the morning of December 26, 2004, and Indian Ocean earthquake near Padang on September 30, 2009, which measured 7,6 on the Richter scale.

2. LITERATURE STUDY

There are four phases of the cycle of disaster management : (i) emergency response, (ii) rehabilitation and reconstruction, (iii) prevention and mitigation and (iv) preparedness. The phases which deals with pre-disaster is referred to as risk management and deals with post-disaster is referred to as crisis management. Figure 2 below presented the schematic of the cycle of disaster management.

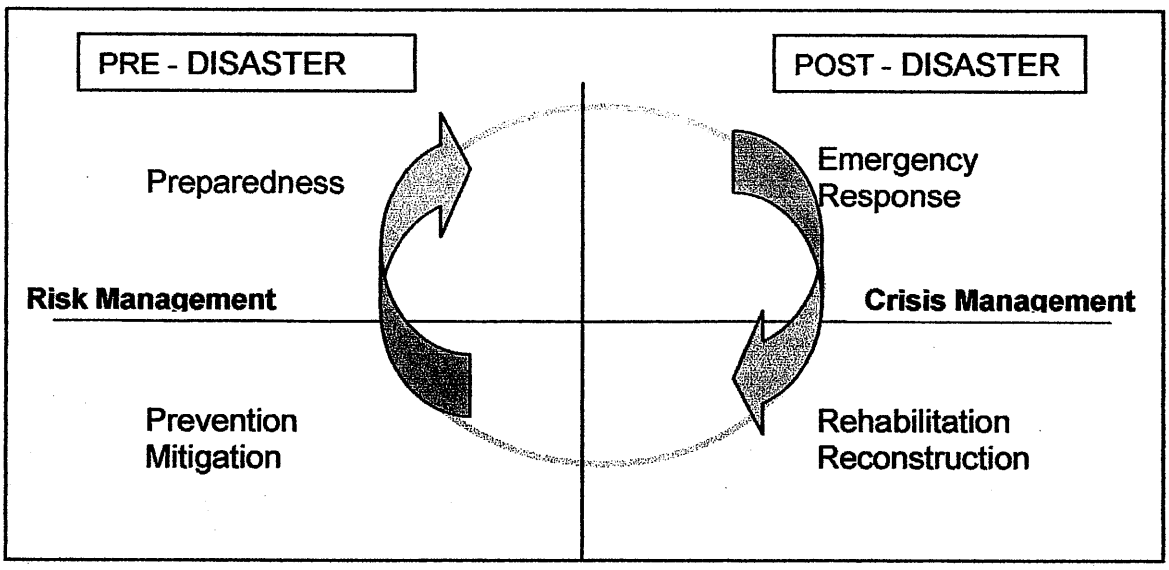

Figure 2. The cycle of disaster management

a. Emergency Response

The emergency response stage is aimed at rescuing the surviving community members and to immediately fulfill their minimum basic needs. The main goal of this response stage is humanitarian rescue and aid. At this response stage, it is also endeavored to complete decent temporary places for refuge, and quick logistic arrangement and distribution that can reach the intended target namely the disaster survivors.

Secondary disasters can be occur caused by heavy rain and aftershock earthquakes. Measures should be taken for the prevention of secondary disaster after a great disaster. There was a great danger that heavy rain would result in secondary disaster where the earth quake had caused sediment blockades of rivers and landslides.

b. Rehabilitation and Reconstruction

The rehabilitation and reconstruction stage is a continuation stage of the emergency response stage with the purpose of restoring public services in a sufficient time and redevelop the community in the context of social, economic, cultural and political life in accordance with the aspiration and the community's demand. Reconstruction of Infrastructure by giving priority to the restoring of basic infrastructure functions such as roads, airports and seaports, telecommunications infrastructure and facilities, the restoring electricity, water supply and housing.

c. Prevention and Preparedness

The basic plan should be taken before the disaster occurred and divided into two preventive measures, ie : structural-meaures (prevention) and non-structural measures (preparedness). The relationship between structural measures and non-structural measures in context of risk management is presented in Figure 5. In terms of structural measures (prevention), the target is to directly minimize disaster damage (reduction or mitigation). There will always be element of probablity indesigning external force. The action shuld be taken such as controlling development in high risk earthquake zones, using building codes that reflect the earthquake risk in the community and so on. In terms of non-structural measures, the key is abundance, meaning strengthening public awareness and preparedness of local government and local communities with the priority on disaster-prone areas, strengthening capabilities in disaster detection and emergency response, strengthening people's capacity through training and education, Issuing procedures and guidelines in disaster management; and so on.

3. PAVEMENT CONDITION POST DISASTER

3.1. Aceh Tsunamis

On the morning of December 26, 2004, earthquake which have magnitude 9.0 on the Richter scale, caused tsunamis and struck Aceh and part of South Sumatera resulting in heavy damages. The hypocentre of the main earthquake was at 160 km west of Sumatra, at a depth of 30 km below mean sea level (initially reported as 10 km). This is at the extreme western end of the Ring of Fire, an earthquake belt that accounts for 81 percent of the world's largest earthquakes. Numerous aftershocks were reported off the Andaman islands and the region of the original epicentre in the hours and days that followed.

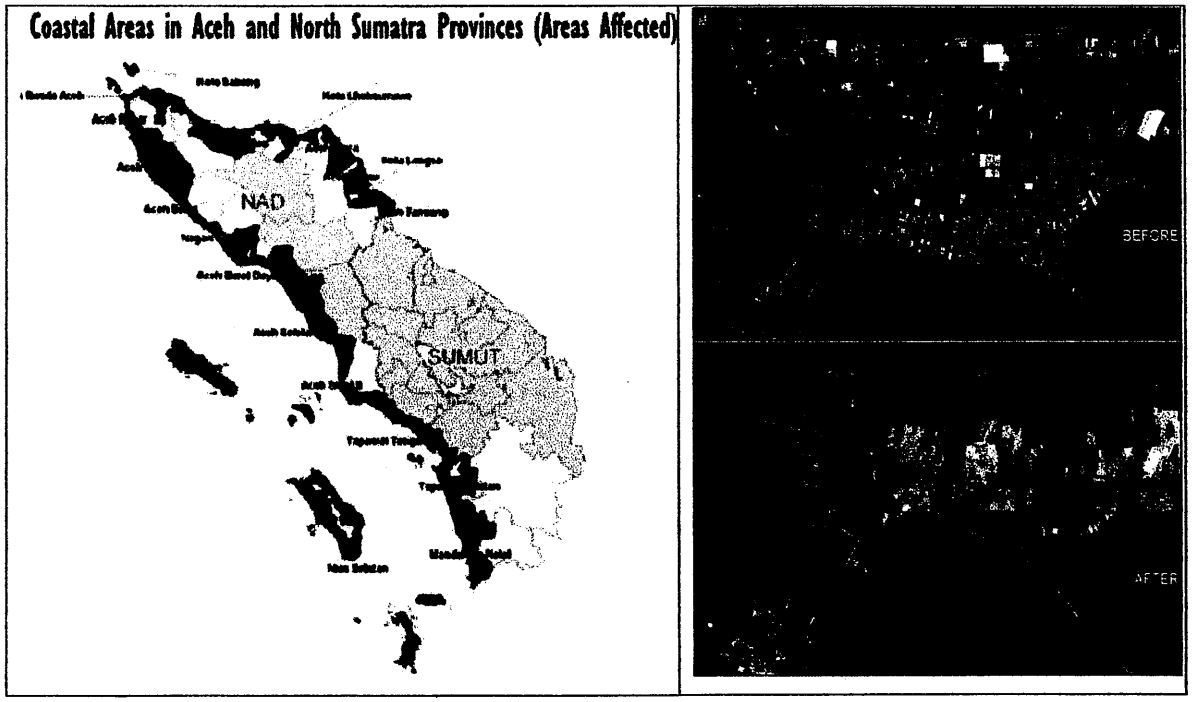

Figure 3. Areas affected, condition before and after tsunami

Based on recent information obtained from the National Coordinating Board for Disaster Management (Bakornas PBP) on March 21, 2005, the fatalities in 20 *kabupatens* in the Province of Nanggroe Aceh Darussalam (NAD) are estimated to reach 126,602 people killed and interned, and 93,638 people missing. Estimated length of primary roads damages :

a. Total damaged arterial roads: **654** km (27.5% destroyed, 45.5% sustained major damage)
b. Total damaged neighborhood roads: **1,361**km (33.7% destroyed, 21% sustained major damage)
c. Total damaged provincial highways: **603** km (38% destroyed,14% sustained major damage)
d. Total damaged bridges: **2,267** units (66.5% destroyed, 18% sustained major damage)
e. Total damaged aqueducts: **9,122** units (83% destroyed, 6% sustained major damage)

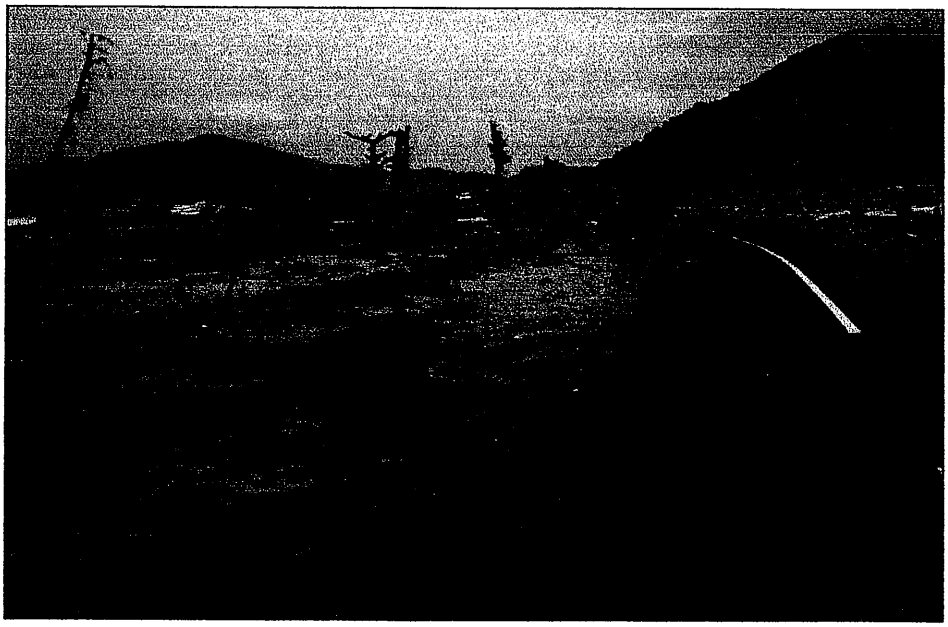

Figure 3. Typical road damages after Tsunami

3.2. Padang Earthquakes

Indian Ocean earthquake near Padang on September 30, 2009, which measured 7,6 on the Richter scale resulting the infrastructure in West Sumatera (Padang) damaged and more then 100 people death. Epicenter located about 45 km from Padang City, and infrastructures damages mostly happen in Padang and Pariaman area.

Typical damages in infrastructure, especially in road pavement are craks, settlement and landslide. Figure 4 – 7 shown the condition of pavement post disaster.

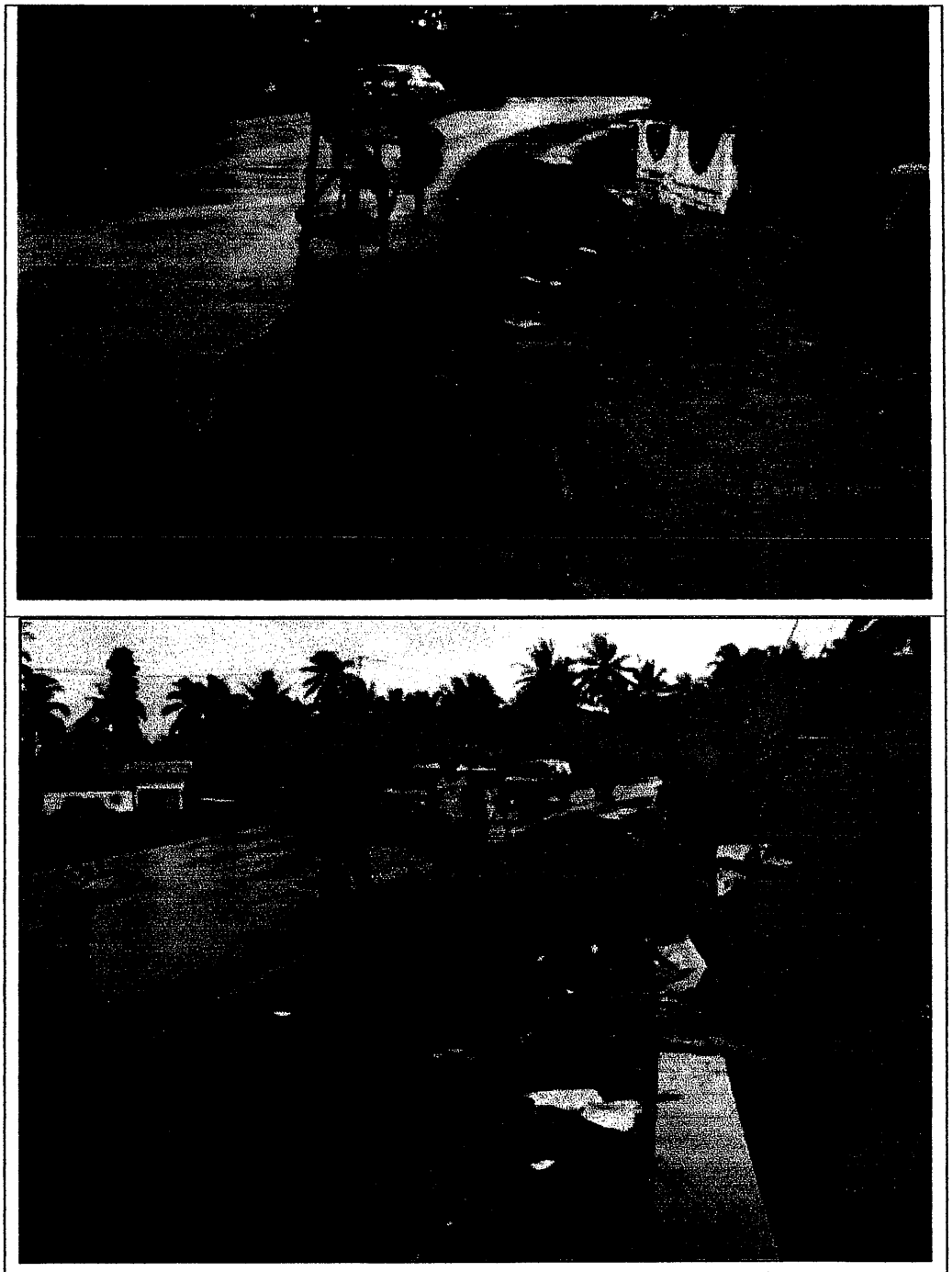

Figure 4. Craks and Settlement in KM 44.5 LUBUK SELASIH-SOLOK

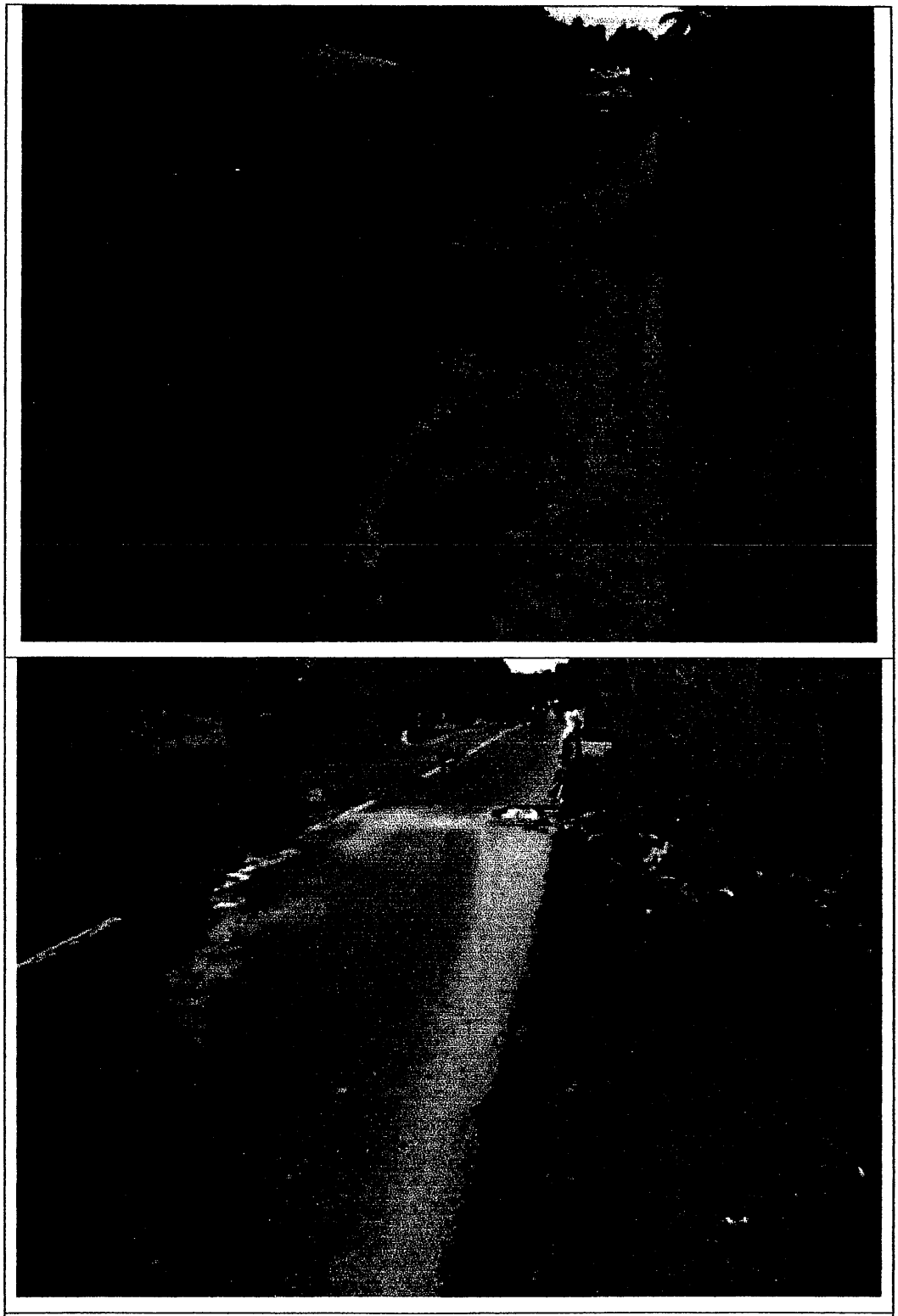

Figure 5. Craks and Settlement in PARIAMAN MANGGOPOH-PADANG

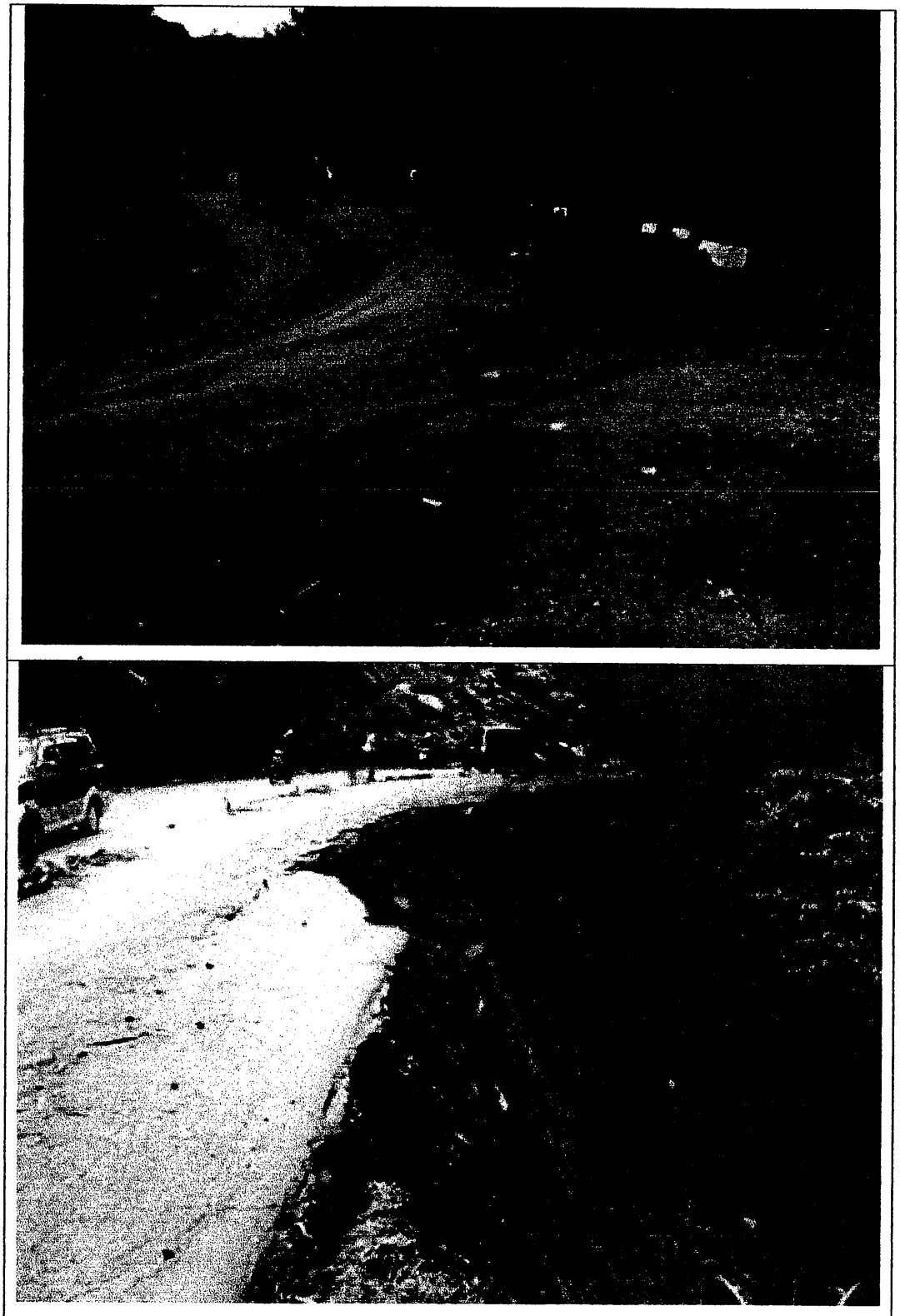

Figure 6. Landslide in Km. 17.9 KOTA PADANG – LUBUK SELASIH

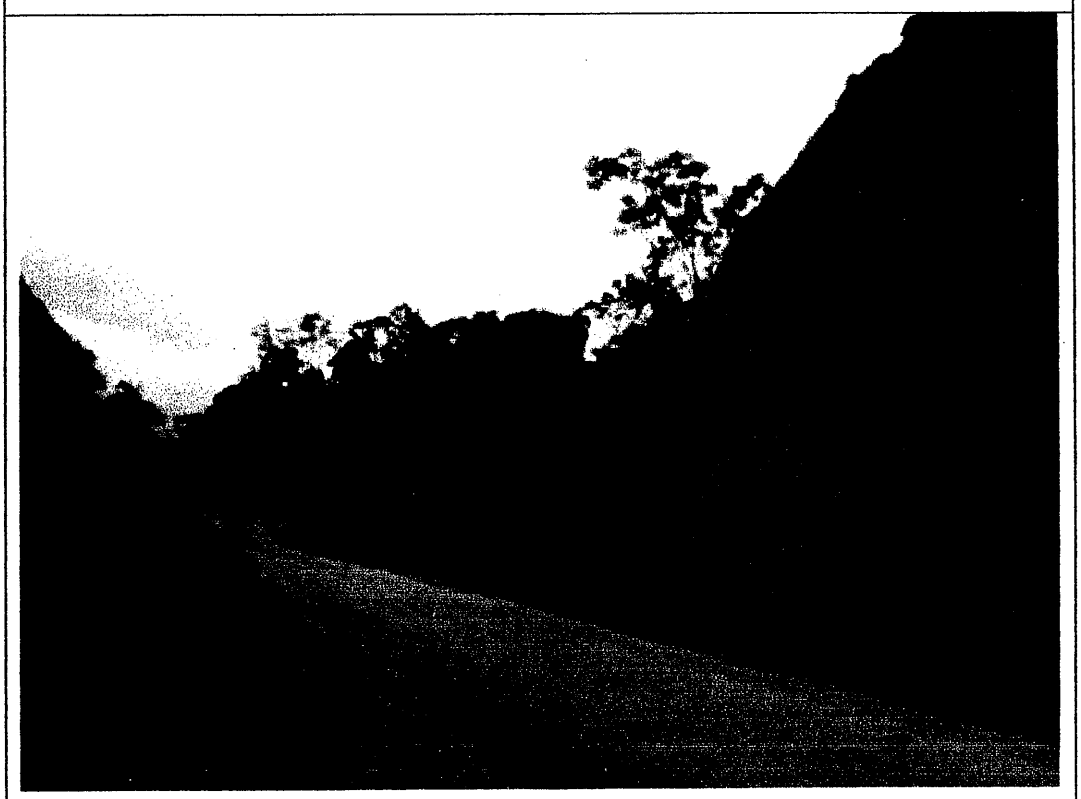

Figure 7. Landslide in roadway and in slope (PARIAMAN MANGGOPOH-PADANG (Simpang Empat Direction)

4. EMERGENCY RESPONSE (Padang Earthquakes)

The Stage of Emergency Response was set for 3 months since the disaster. At the stage of emergency response, the Board has coordinated these following emergency efforts:

a. Preliminary countermeasure

   After the disaster, the government first estimates the damages such as death, injured, collapsed infrastructures, water supply, electrical and communication damages. The first estimation is needed in order to set up a system of disaster management.

b. Emergency countermeasure

   - Mobilization of search and rescue teams (army, police, red cross, government official and volunteers)
   - Immediately helping the disaster survivors
   - Temporary restoration of the basic infrastructure that support life, such as temporary dwelling, sanitation, water supply, electricity, communications and transport facilities.

Taken measures for transportation

Much of the primary transportation infrastructure of West Sumatera province especially in Padang and Pariaman areas, was damages. Typical damages such as landslide, settlement and craks. Measures should be taken to repaired roads and bridges. Damages roads are repaired using minimum pavement structure, such as :

a. Remove soil and install caution signs

   At the landslide area, soil should be remove from the road pavement to allow traffic flow, and install caution sign.

b. Crack shall be sealed immediately

   Cracks is caused by settlement associated with an underground movement or landslide. Considering the rainy season, the craks in the pavement should be sealed imemediatly to protect the pavement structure from infiltrate water and secondary landslide.

c. Sand bags or gabion installment

Temporary treatment for landslide should be taken, such as sand bags or gabion installment.

d. Divert water flow and construct temporary drains

Secondary disasters can be occur caused by heavy rain and aftershock earthquakes. To prevent the landslide it need to construct temporary drain and divert water flow.

Prevention of secondary disasters

There was a great danger that heavy rain would result in secondary disaster such as landslides. Measures for prevention to landslide or slope failure :

a. Close the areas where there was fear of damage
b. Making temporary drainage to protect the landslides area from water flow
c. Strengthened inspection

5. RECONSTRUCTION & REHABILITATION (Padang Earthquakes)

In conjunction with selecting the most effective and economical landslide treatment, other factors must be considered, including safety, construction scheduling, availability of materials, site accessibility, equipment availability, aesthetics, budget for design and construction, and environmental impact. Some datas is needed to used in design ie. soil investigation, mapping and geology survey. There are many technique for strengthened, ie :

Treatment for strengthened slope :

a. Restoration with planting

Restoration with planting is used on the slopes that does not collapse under normal condition (standard slope gradient). Some specific technique are : lined turfing, lined planting, sodding, vegetation matting (covering with mats containing seeds and fertilizer), seed spraying, spraying vegetation substrate (soil dressing, thick-layer substrate spraying), vegetation sand bags (use of sand bags containing seeds and fertile soil).

b. Restoration by facing structures

This technique is used when planting is not practical such as with bedrock slopes. Some specific techniques are : mortar or concrete spraying, stone or block pitching, concrete block pitching, cribbing with concrete block, cribbing by mortar and gabions.

c. Restoration with structures

This method is applied when slopes length would be too long and not enough space to make standard slope gradient. Some specific techniques are : retaining wall made of piled stone or concrete block, concrete retaining walls, lattice walls, anchoring and reinforced earth walls.

d. Other techniques

Other techniques of slope restoration include soil improvement and drainage works. Soil improvement is done to improve stability, using chemical injection or lime soil stabilization.

Treatments for strengthening pavement :

a. SAMI

A strain alleviating membrane interlayer (SAMI) is a sprayed seal surfacing, which is covered with a thin layer of asphalt as part of the surfacing treatment. The sprayed treatment acts as a membrane interlayer, which is designed to eliminate or minimize reflection cracking in a pavement by the use of either :

- a higly modified polymer modified binder
- a geotextile with an unmodified binder

b. Asphalt Overlay

An asphalt overlay is an application of a layer asphalt to an existing pavement surface. Overlay are used to strengthened pavement, they are also placed to remedy surface deficiencies such as shape and roughness.

c. Reconstruction of pavement

Resources :

1. RDCRB, 2009, "Survey for emergency response post earthquake in West Sumatera", RDCRB Bandung, 2009
2. Nyoman Suaryana, 2005, " Report of training in Disaster Mitimigation and Restoration System for Infrastructure (for Civil Engineer), Japan 2005", RDCRB Bandung 2005

UTILIZATION OF BUTTON NATURAL ASPHALT (ASBUTON) PROBLEM AND SOLUTION

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Abstract

In recent years there are two main issue that occurred on an pavement constraction work in Indonesia, the first issue is the need for national asphalt can not be met so that the domestic suppliers need to import. The second issue is not achieved due to the age of the plan indicated early damage because the asphalt was softer or the asphalt was harder of asphalt used.
One way to reduce imports and improve the performance of asphalt mixtures is the use of domestic products is the use of natural asphalt found in Southeast Sulawesi, Buton Island, called Asbuton (Buton Rock Asphalt) was the region with the largest deposits of natural asphalt in the world at around 677 million tonnes or equivalent with approximately 170 million tons of asphalt.
In its use for construction pavement, Asbuton experiencing some constraints in terms of quality Asbuton produced, the use of modifiers is not appropriate and the technology used to make asphalt mixtures with Asbuton. This happened before the year two thousand, but after the year 2005 produced grain asbuton and pre-blended asbuton that serves as a substitute for oil and asphalt additives, these constraints can be more or less been solved.
From studies in the laboratory that had conducted showed that asphalt mix plus Asbuton has several advantages such as increasing the value of Marshall stability of up to 19%, value of resilient modulus of up to 36% (25°C) and dynamic stability up to 71%, compared with a mixture of asphalt mix without asbuton.

Keywords:

Asbuton, National Asphalt, Age of the Plan, Construction Pavement, Modifiers, Grain Asbuton.

1. INTRODUCTION

There are two major issue for asphalt work in Indonesia, the first issue is the need for national asphalt maintenance, improvement, accessibility and development of road transport is estimated at 1.2 to 2 million tons and will continue to increase with the growth of development can not be supplied by Pertamina.

Pertamina as the main supplier of asphalt supply in the country is only able to provide for about 600,000 tons/year, so to meet the shortage of supply of asphalt is

done by way of diminishing the import of foreign exchange. The second issue, Indonesia with high rainfall and the heat of the sun throughout the year coupled with heavy traffic which will encourage uncontrolled early damage in the form of cracking or deformation.

One alternative that can be considered to reduce imports and improve the performance of asphalt mixtures is the use of asphalt domestic product is the use of natural asphalt found in Southeast Sulawesi, Buton Island, commonly called Asbuton (Buton Rock Asphalt), which is the region's largest deposit of natural asphalt in the world which is about 677 million tons. Asbuton was found by Dutch East Indies government in 1924 and managed by NV Mijnbouw en Cultuur Maatschapij Boeton (1924-1954), then managed by Indonesia government through mining concessions until now.

Most of these deposits have been explored in the area Lawele, of ± 210 million tons, equivalent to ± 63 million tons of asphalt cements. During this Asbuton exploited in the mining area and surrounding Kabungka, whereas relatively low amount of deposit, which is about 60 million tons, equivalent to ± 12 million tons of asphalt cement.

2. ASBUTON DEPOSIT

There are two types of natural asphalt, natural asphalt lake (lake asphalt) and natural rock asphalt. When compared with a deposit of natural asphalt in other countries, the island of Buton smoothly largest deposit of natural asphalt in the world as shown in Table 2.1.

Table 2.1 Deposits of natural asphalt in the world

No.	Country	Estimates deposits of natural asphalt (tons)
1.	Indonesia	677.000.000
2.	Asiatic	35.000.000
3.	Canada (Trinidad Lake Asphalt)	30.000.000
4.	Switzerland	10.000.000
5.	France	7.000.000
6.	Bosnian	7.000.000

Asbuton is natural rock asphalt found on the Buton Island, southeast Sulawesi, formed naturally by geological processes since thousands or even millions of years ago, asbuton formation derived from crude oil that pushed the surface slip out the porous rock. Generally rock type impregnated crude oil were lime stone, clay stone or sand stone.

Natural asphalt is available on Buton Island has a very large reserves, with asphalt levels varied between 10% and 50% with spread from the bay location Sampolawa up to Lawele bay along 75 km with a width of 27 km, as an illustration, the location of natural bitumen deposits in the island of Buton, shown in Figure 2.1.

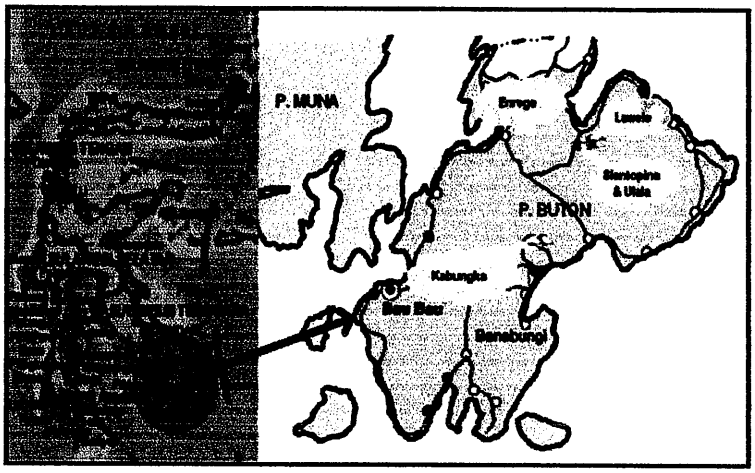

Figure 2.1 Location of Buton Island deposits

Exploration undertaken Alberta (1989) at 132 points Lawele on drilling Asbuton thick obtained ranged from 9 meters to 45 meters or an average of 29.88 meters thick. Witch is a thick ground cover from 0 to 17 meters or an average of 3.0 meters thick ground cover, 47 meters in the distribution area of the deposit Asbuton 1527343.5 m^2.

The data is equipped with advanced studies conducted by KPN Dharma Bhumi, mining fields and energy Southeast Sulawesi province, 1997 and satellite data that shows total reserves of natural asphalt in the entire island of Buton is about 677.247 million tons of scattered area, Waesiu 0.100 million tons; Kabungka 60 million tons; Winto 3.2 million tons, 0.600 million tons Winil; Lawele 210.283 million tons, 181.25 million tons Siantopina, Olala 47,089, Enreko (Coolie Milk) 174.725 million tones.

Table 2.1 Estimated Deposit Asbuton in Lawele and surrounding areas

No.	Location	area,m^2	Thick (m)	bitumen content,%	Deposit (tones)
1.	Batuawu	550.000	76.1	20 – 40	60.69
2.	Mempenga	280.000	72	20 – 30	29.232
3.	Lagunturu	420.000	61	20 – 25	37.149
4.	Kabukubuku	570.000	50	20 – 35	41.325
5.	Wangkaburu	460.000	62.8	20 - 35	41.888
6.	Siantopina	5000.000	25	Unknown	181.25
7.	Ulala	1.500.000	21.65	Unknown	47.089

Source: Report Estimation Geolistrik and core drilling Lawele village Asbuton, KPN Dharma Bhumi, mining fields and energy Southeast Sulawesi province, 1997

Of the many Asbuton deposit locations, only locations are Kabungka deposit has been mined and exploited, other areas such as the deposit location Lawele, new in the exploration stage and little use. Therefore, so far engineered paving roads in Indonesia are only known natural asphalt Asbuton characteristics of Kabungka. In general can be distinguished two types of Asbuton with different characteristics that are hard as the Kabungka and are relatively soft from Lawele.

From the results of exploration, the area has a kind Lawele soft Asbuton covered with a layer of soil (overburden) on average between 0 to 4.9 meters. Further exploration of the results was also mentioned that there have been some obstacles to carrying out drilling, one of which is sticky with asbuton drill, and it's likely due to very soft under layer asbuton.

3. CHARACTERISTICS OF ASBUTON

As already known, in the Asbuton there are two types of main element, namely bitumen (asphalt) and minerals. In the utilization of asphalt work, the two types of elements of a dominant will affect the performance of the designed asphalt mixtures.

The results of physical and chemical analysis of bitumen Asbuton from Kabungka and Lawele locations are shown in Table 3.1 and Table 3.2.

Table 3.1 The results of physical testing of bitumen Asbuton from Kabungka and Lawele

Type of physical testing	Result of test	
	Asbuton from Kabungka	Asbuton from Lawele
Bitumen content,%	20	30.08
Penetration, 25°C,100 gr, 5 sec, 0,1 mm	4	36
Softening point, °C	101	59
Ductility, 25°C, 5cm/minute, cm	< 140	>140

Solubility in C_2HCL_3, %	-	99.6
Flash point, °C	-	198
Specific gravity	1.046	1.037
LOH (TFOT), 163°C, 5 hours	-	0.31
Penetration after TFOT, % fresh	-	94
Softening point after TFOT, °C	-	62
Ductility after TFOT, cm	-	>140

Table 3.2 The result of chemistry testing of bitumen Asbuton from Kabungka and Lawele

Type of chemistry testing	Result of test	
	Asbuton from Kabungka	Asbuton from Lawele
Nitrogen (N),%	29.04	30.08
Acidafins (A1), %	9.33	6.60
Acidafins (A2), %	12.98	8.43
Parafin (P), %	11.23	8.86
Maltene	1.50	2.06
Nitrogen/Parafin, N/P	2.41	3.28
Asphaltene content, %	39.45	46.92

Judging from their chemical composition, bitumen of Asbuton from both regions has deposits of nitrogen compounds and high base maltene good parameters. This indicates that Asbuton can serve as a good adhesive to aggregate and sufficient durability. But viewed from the other characteristics, penetration value of Asbuton Kabungka has a relatively low penetration compared to Asbuton from Lawele. In order Asbuton from Kabungka can be utilized in asphalt mixed, Asbuton be undertaken in such a way that has characteristics approaching the characteristics of the asphalt cement.

From the description shows that the largest deposits Asbuton in Buton island located in Lawele with high quality asphalt, which needs to be done is an appropriate technology so that the nature of Lawele asphalt can be used in asphalt road paving work.

Minerals of Asbuton dominated by "Globigerines limestone 'limestone is a very fine micro-organism is formed from ancient animal micro-foraminifera have very fine qualities, hard-yield relatively high calcium and good as a filler in asphalt mixtures.

Gradation test results and chemical analysis mineral extraction results from the location Kabungka and Lawele shown in Table 3.3 and Table 3.4.

Table 3.3 Mineral gradation of Asbuton from Kabungka and Lawele

Sieve Size		passing (%)	
ASTM	mm	Asbuton from kabungka	Asbuton from Lawele
No.8	2.38	100	100
No.30	0.595	100	99.1
No.50	0.297	100	89.1
No.100	0.148	95.6	49.3
No.200	0.074	4.5	32.2

Table 3.4 Mineral composition of Asbuton from Kabungka and Lawele

Compounds	mineral chemist analysis	
	Asbuton from kabungka	Asbuton from Lawele
$CaCO_3$	86.66	72.90
$MgCO_3$	1.43	1.28
$CaSO_4$	1.11	1.94
CaS	0.36	0.52
H_2O	0.99	2.94
SiO2	5.64	17.06
$Al_2O_3 + Fe_2O_3$	1.52	2.31
Residu	0.96	1.05

4. BARRIERS TO USE ASBUTON

In the decade of the eighties to the nineties, asbuton, usually used for cold mix asphalt, which is used conventional asbuton, but a failure caused by:

- bitumen content vary widely, the levels of conventional asphalt Asbuton can vary up to 10%
- grain size is relatively large, the specifications required for Asbuton layer aggregate mixture has maximum grain size is passed sieve No. 4 (4.76 mm), the reality on the ground asbuton grains found in above 1 inch (2.54 mm), where this will affects asbuton asphalt activate by modifier material.
- modifier material not suitable to activate the bitumen asbuton
- Asbuton contamination between the clay and the other materials at accumulation and transport.
- asbuton water content is high, the water content conventional asbuton can occur up to above 20%.

Mixed failure due to cold, tried Asbuton used in asphalt mixtures in a warm but experienced several problems, namely:

- modifications must be made in mixer,
- modifier kind of inappropriate,
- the use of cold mix in locations with heavy traffic and

- Asbuton water content is high.

The next effort is to make an asbuton hot mixing, but although the results are relatively good, there are still obstacles include:

- must make modifications mixer,
- modifier types of inappropriate and
- Water levels are relatively high.

5. IMPROVING PERFORMANCE MIXTTURE DONE USING ASBUTON

The work done to improve the performance of asphalt mixtures using asbuton are:

- Uniform bitumen content and grain products generated asbuton fabrication, such as Butonite Granular Asphalt (BGA), Butonite Rock Asphalt (BRA), Lawele Granular Asphalt (LGA) and refined Asbuton bitumen (Refine Buton Asphalt, Retona).
- Minimizing water content resulting asbuton while protecting the addition of water content, for example by packaging
- Producing asbuton that can be used directly, without making any modifications to the equipment used for mixing, for example BGA supplied through feeder filler.
- Conduct pre blended between the asphalt asbuton hard grains with a specific process that occurs mixture homogeneity, for example refined Asbuton bitumen (Refine Buton Asphalt, Retona) mixed with asphalt cement before inserted into the mixer.
- Conduct barring the placement of asphalt mixtures using asbuton, for example for low traffic use cold mix Lasbutag, for traffic being able to use a asbuton warm mixture and asbuton for heavy traffic can be used asbuton hot mixture.
- If the asbuton modifier must be used, choose the appropriate modifier, for example to asbuton warm mixture can be used PH-1000 which has a viscosity modifier that between 1000 to 1200 cSt.
- Making modifications mixer that can be used for hot asphalt mixtures using hard asphalt and can be used to mix the mixture using asbuton.
- An activity is already done and has given satisfactory results. The last attempt was done LGA mixes are hot without modifying the asphalt mixing plant (AMP).

6. TYPE ASBUTON THAT HAVE BEEN PRODUCED

Asbuton types that have been produced in fabrication and manual in recent years that have been recommended are granular type, refined Asbuton bitumen (refine Buton asphalt, Retona) and pure refined Asbuton bitumen (full extraction results).

Of the three types that have been recommended asbuton, only two types have been produced which has done manufacturers and full scale test by IRE and used for projects that use the type asbuton granular and (refine Buton asphalt, Retona).

6.1. Granular Asbuton

Granular Asbuton is the result of processing solid Asbuton which broke with a stone-breaker (crusher) or other appropriate solvers that have a certain grain size.

Since 2005 there are four types of grain produced asbuton, classification of type asbuton basis points based on class penetration and bitumen content. Terms asbuton into four types of granular are shown in Table 6.1 Granular Asbuton are generally used in cold mix asphalt, a mixture of hot and warm the mixture as a binder or added ingredients (additives).

Table 6.1 Granular Asbuton requirements

Properties of Asbuton	Test method	Type 5/20	Type 15/20	Type 15/25	Type 20/25
Bitumen content of asbuton; %	SNI 03-3640-1994	18-22	18 - 22	23-27	23 - 27
Grain size of asbuton					
- Passing No 8 (2,36 mm); %	SNI 03-1968-1990	100	100	100	100
- Passing No 16 (1,18 mm); %	SNI 03-1968-1990	Min 95	Min 95	Min 95	Min 95
Water content, %	SNI 06-2490-1991	Max 2	Max 2	Max 2	Max 2
Penetration of bitumen: 25 °C, 100 g, 5 sec; 0,1 mm	SNI 06-2456-1991	≤10	10 - 18	10 - 18	19 - 22

Note:
1. Type 5/20 : penetration grade of 5 (0.1 mm) and bitumen content of 20 %.
2. Type 15/20 : penetration grade of 15 (0.1 mm) and bitumen content of 20 %.
3. Type 15/25 : penetration grade of 15 (0.1 mm) and bitumen content of 25 %.
4. Type 20/25 : penetration grade of 20 (0.1 mm) and bitumen content of 25 %.

6.2. Asphalt cement modified by Refined Asbuton bitumen

There are several products extracted (Refine) Asbuton bitumen content of between 60 to 100%. To harness the power of the asbuton mineral filler, made extraction asbuton only reached a certain content of bitumen, typically between 50 to 60% the way to making a modified asphalt asbuton or commonly called pre-mixed asbuton. To be used as a binder or modifier softener needed, generally using asphalt cement, Asphalt cement requirements were modified with Asbuton shown in Table 6.2.

Table 6.2 Requirements of Asphalt cement modified by Refined Asbuton Bitumen (Refine Buton Asphalt, Retona)

No.	Test	Test Method	Requirements
1.	Penetration, 25°C,100 g, 5 sec, 0,1 mm	SNI 06-2456-1991	40 - 60
2.	Softening point, °C	SNI 06-2434-1991	Min. 55
3.	Flash point, °C	SNI 06-2433-1991	Min. 225
4.	Ductility, 25°C, 5cm/minute, cm	SNI 06-2432-1991	Min. 50

5.	Specific gravity	SNI 06-2441-1991	Min. 1,0
6.	Solubility in C_2HCL_3, % by weight	RSNI M-04-2004	Min. 90
7.	LOH (TFOT), % by weight	SNI 06-2440-1991	Max. 1
8.	Penetration after LOH, % by fresh	SNI 06-2456-1991	Min. 55
9.	Ductility after TFOT, cm	SNI 06-2432-1991	Min. 25
10	Mineral passing No. 100, %	SNI 03-1968-1990	Min. 90

Asphalt cement modified with Refined Asbuton Bitumen or pre-mixed asbuton can be obtained by mixing grain that has asbuton in extraction part with asphalt cement pen 60 or 80 pen, whose creation is done with the fabrication process flow chart as shown in Figure 6.1.

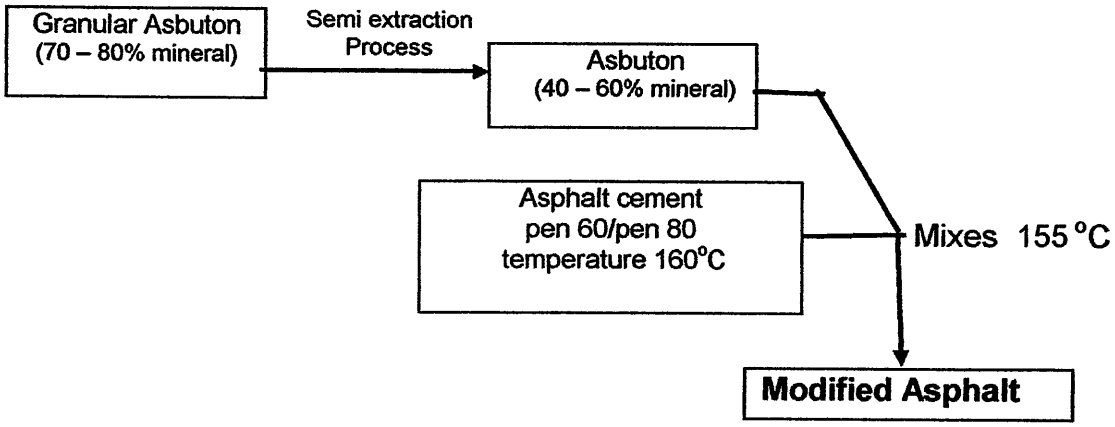

Figure 6.1 Process of modified asphalt cement by granular asbuton
Source: Retona blend 55, 2008

6.3. Pure Refined Asbuton Bitumen (Full extraction)

Pure refined asbuton bitumen is asbuton types obtained from the total extraction of asbuton with 100% bitumen content.

Pure refined asbuton bitumen in a mixture of asphalt can be added as an ingredient asphalt or as a binder as well as ready-made standard asphalt or asphalt cement equivalent.

If the extracted bitumen has a low penetration, to create the equivalent asphalt cement grade with certain characteristics may be tempered by the added material in this case asphalt pen 60, pen 80 or pen 120 at a particular composition.

7. STUDY IN THE USE OF HOT MIXED GRANULAR ASBUTON

7.1. Test characteristics and performance of asphalt mixtures

To analyze the characteristics and performance of asphalt mixtures without and with Asbuton, as the sample used Asbuton from Lawele shaped grains, among other test results to obtain the characteristics of asphalt mixtures using the Marshall method, the performance of mixed use Wheel Tracking Machine tools, test equipment fatigue using Dartec and stiffness modulus test using a UMMATA.

7.1.1. Marshall Test

For the analysis of the characteristics of hot asphalt mixture with and without granular Asbuton, Marshall test performed, test results are shown in Table 7.1.

Table 7.1 Marshall Test result

No.	Test	Test result with % granular Asbuton			Requirement
		0 %	5%	10%	
1	Optimum bitumen content,%	6.00	6.40	7.20	-
2	Density, gr/cm3	2.304	2.280	2.242	-
3	Voids in Mineral Aggregate, %	17.42	18.30	20.20	Min.15
4	Voids filled bitumen, %	70.80	71.60	74.00	65
5	Voids in Mixes (VIM). %	5.09	5.12	5.30	4.9-5.9
6	VIM on absolute density, %	3.31	3.80	2.70	Min.2.50
7	Stability , kg	953	956	960	Min.800
8	Flow, mm	2.03	3.01	3.10	Min.2
9.	Retain Stability, %	93	87	86	Min 85
10	Marshall Quotient, kg/mm	336	295	320	Min 200

With the addition Asbuton in hot mixture asphalt have a tendency to raise the value of stability and optimum bitumen content in the mixture, this phenomenon occurs because the assumption of asphalt serves from Asbuton as direct asphalt cement. This was also followed by the rise in the voids in mineral aggregate, voids filled bitumen, the voids in a mixture with equal value. This volumetric balance value makes the mixture easier to work in the field.

7.1.2. Test with a groove depth of Wheel Tracking Machine

To know the effect of the addition Asbuton in hot mixture asphalt to deformation, the test conducted using the wheel tracking machine tools. Test results are shown in Table 7.2. and graph the relationship with the depth of the track deformation happens in Figure 7.1.

Table 7.2 Wheel Tracking Machine test result

Number of passing	% Asbuton grains in mixture		
	0%	5%	10%
0	0	0	0
21	1.39	1.25	1
105	2.01	1.85	1.52
210	2.37	2.17	1.79
315	2.64	2.39	1.97
630	3.22	2.85	2.29
945	3.67	3.16	2.52
1260	4.09	3.4	2.71
Do (mm)	2.44	2.44	1.95
DS(T/mm)	1536.6	2625	3315
R (mm/m)	0.0273	0.016	0.0127

Additions Asbuton in the mix to give permanent deformation decreasing trend indicates that a hot mixture of asphalt more resistant to deformation.

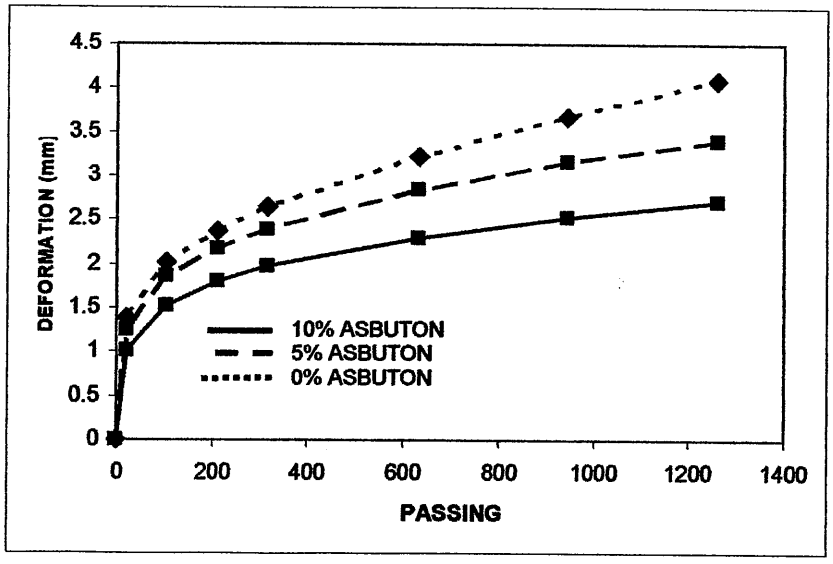

Figure7.1 Graph showing the relationship deformation with passing

7.1.3. Test the resistance to Fatigue

To determine the influence of resistance fatigue addition Asbuton in hot mixed asphalt, fatigue testing using Dartec, test results are shown in Figure 7.2.

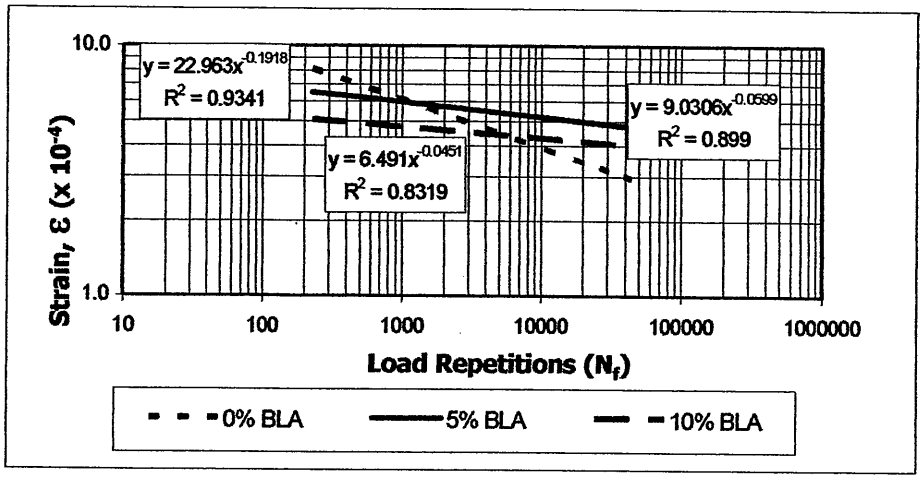

Figure 7.2 Graph showing the relationship between load repetitions with tensile strain (ε)

7.1.4. The Stiffness Modulus Test

To find out the value modulus of asphalt mixtures produced with the addition of Asbuton, using the Universal Machine Testing Apparatus (UMATA), test results are shown in Table 7.3. Stiffness Modulus of Bituminous Mixes depend on temperature time of loading and the stiffness modulus of the bitumen, therefore, the modulus test carried out with temperature variation.

Table 7.3 Test result

Test temperature °C	Stiffness Modulus, MPa		
	0% Asbuton	5% Asbuton	10% Asbuton
25°C	3488	4466	4729
35°C	1472	2181	2432
45°C	681.3	1281	1332

From data on Table 7.3 shows the addition of more Asbuton in the mix, the higher the modulus value. Besides the addition Asbuton looked in the mix will cause more resilient to temperature increases.

7.2. Simulation calculations determining the thick overlay

Test results with the data that has been done, to know the effect of the use of granular Asbuton Lawele in hot mixed asphalt simulation calculations performed overlay determination, field data are used as the simulation is data on roads Padalarang - Purwakarta.

- Existing road:
  - Surface layer (asphaltic concrete), thickness : 5 cm,
  - Base layer (crushstone base), thickness : 13 cm
  - Subase layer (gravel) thickness : 20 cm
  - Subgrade
- Data traffic:
  - ADT : 21,586 vehicles per day for two-way and heavy vehicles ± 30%.
  - ESA :3,914,000 per year
- Overlay for design life : 5 years
  With a variety of Asbuton addition Lawele 0%, 5% and 10% of the total mixture, in this case, obtained a thick overlay:
  - hot mixed asphalt concrete without Asbuton: 10 cm
  - hot mix asphalt concrete with 5% Asbuton: 8 cm
  - hot mix asphalt concrete with 10% Asbuton: 7.75 cm

The calculations above show that the addition of the mixture Asbuton can reduce the required thick overlay.

8. CONCLUSION

Based on the above description can be concluded matters as follows:

1. Bitumen Asbuton has deposits of nitrogen compounds and high base maltene good parameters, so good adhesive to aggregate and sufficient durability.
2. To reduce the failure rate and reduce the cost of construction, the recommended granular Asbuton with the grain size is very small (1.18 mm), with appropriate quality control
3. Asbuton mixing can be carried out by heat, by considering Asbuton type, type and location of placement modifier mixture.
4. Asbuton functions in the mixture, as well as additives that improve the characteristics of the mixture can also substitute the use of asphalt cement.
5. Can substitute with asphalt cement in the mix and have a level higher reliability, the use Asbuton can save foreign exchange, in addition to other benefits such as tax revenue.
6. At the design life and the same location, a thickness layer of asphalt concrete overlay is needed mix asphalt asbuton with 5% is 20% thinner than the asphalt cement asphalt mixtures.
7. To get better quality Asbuton product, research and development has been on going

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Technical Session II
DISASTER AND BRIDGE

PUBLIC WORKS RESEARCH INSTITUTE

SEISMIC DESIGN AND SEISMIC RETROFIT FOR HIGHWAY BRIDGES IN JAPAN

Guangfeng ZHANG
Public Works Research Institute, Japan
March 1-4, 2010

Improvement of Seismic Design Specifications for Highway Bridges

Earthquakes	Seismic Design Specifications
1923 Great Kanto E.Q. (M7.9)	1926 Design Specifications of Road Structure Introduction of seismic design
1964 Niigata E.Q. (M7.5)	1971 Seismic Design Specifications
1978 Miyagi-ken Oki E.Q. (M7.1)	1980 Design Specifications for Bridges
1995 Hyogo-ken Nanbu (Kobe) E.Q. (M7.2)	1996 Design Specifications for Bridges
	2002 Design Specifications for Bridges (Current version)

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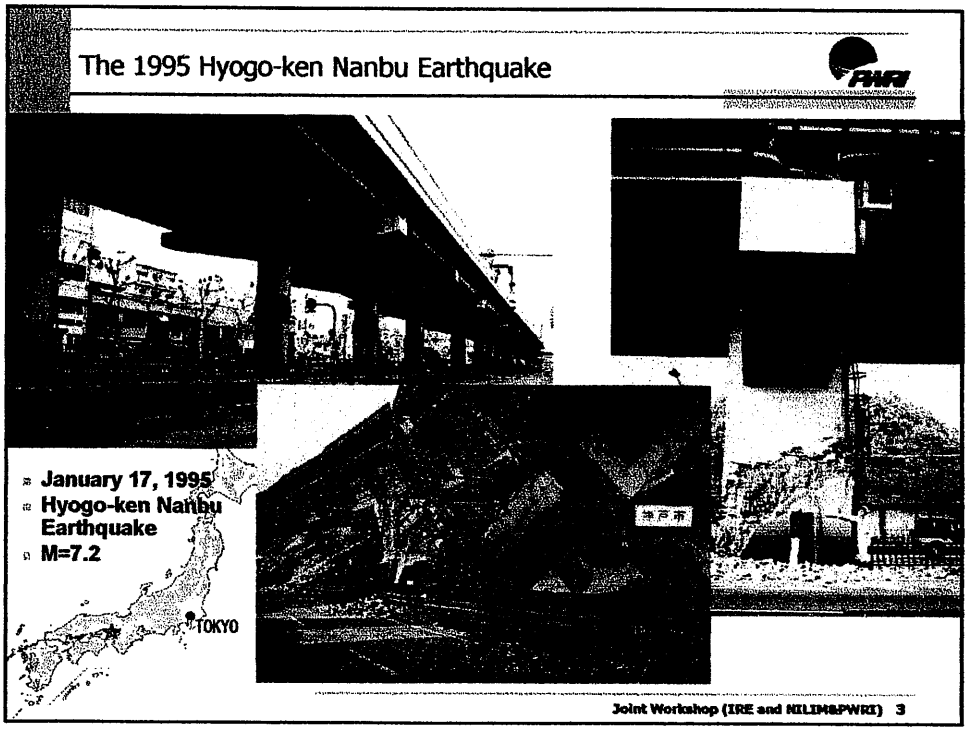
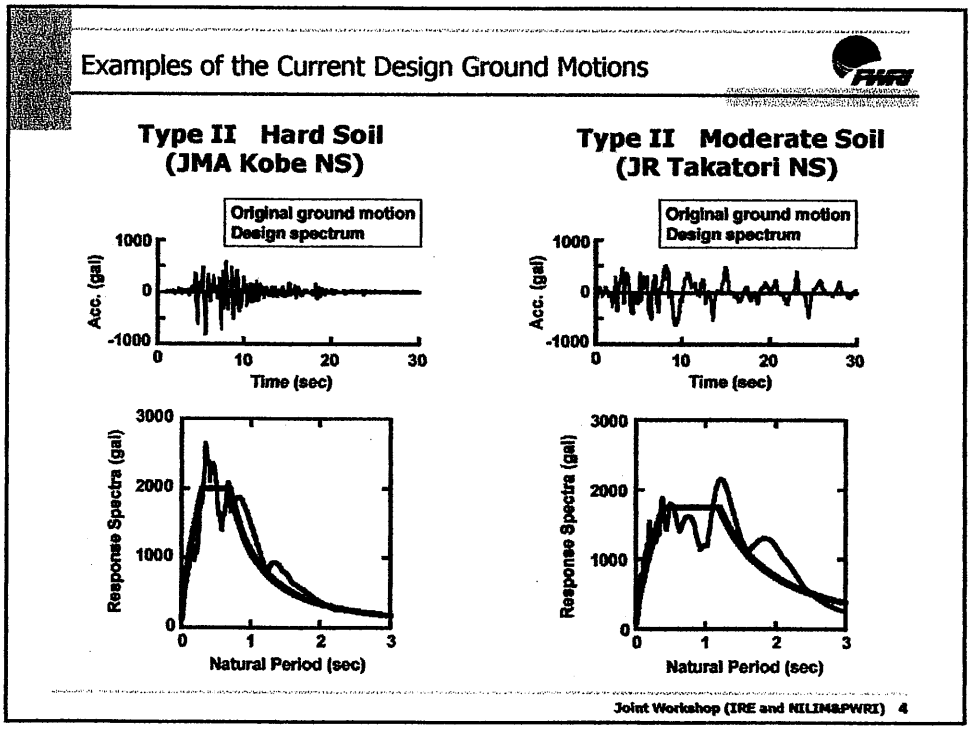
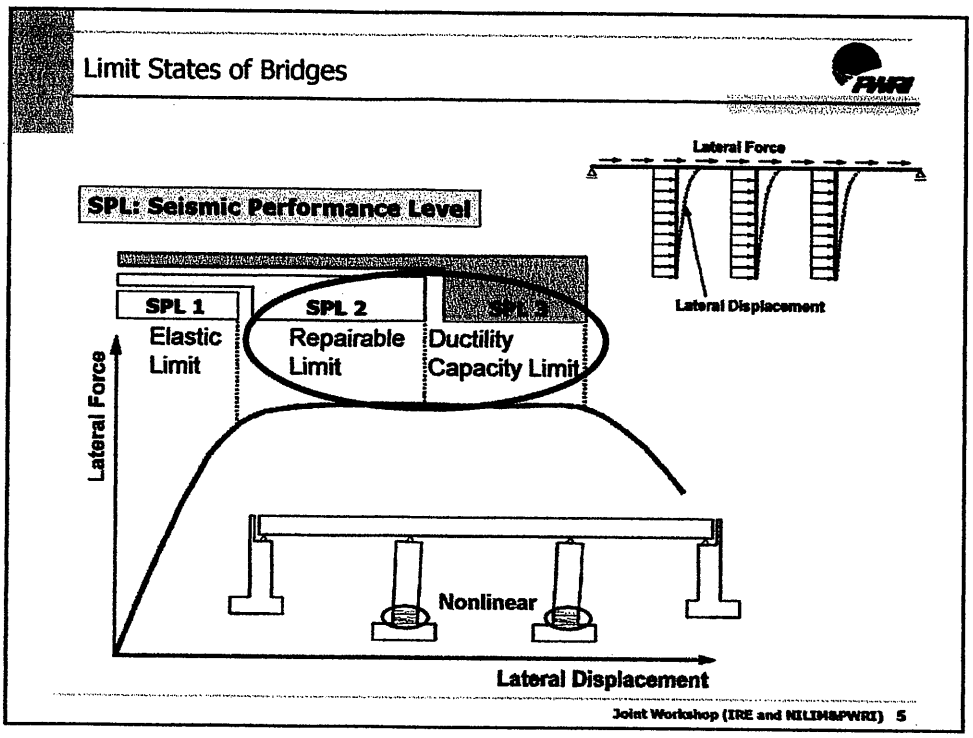
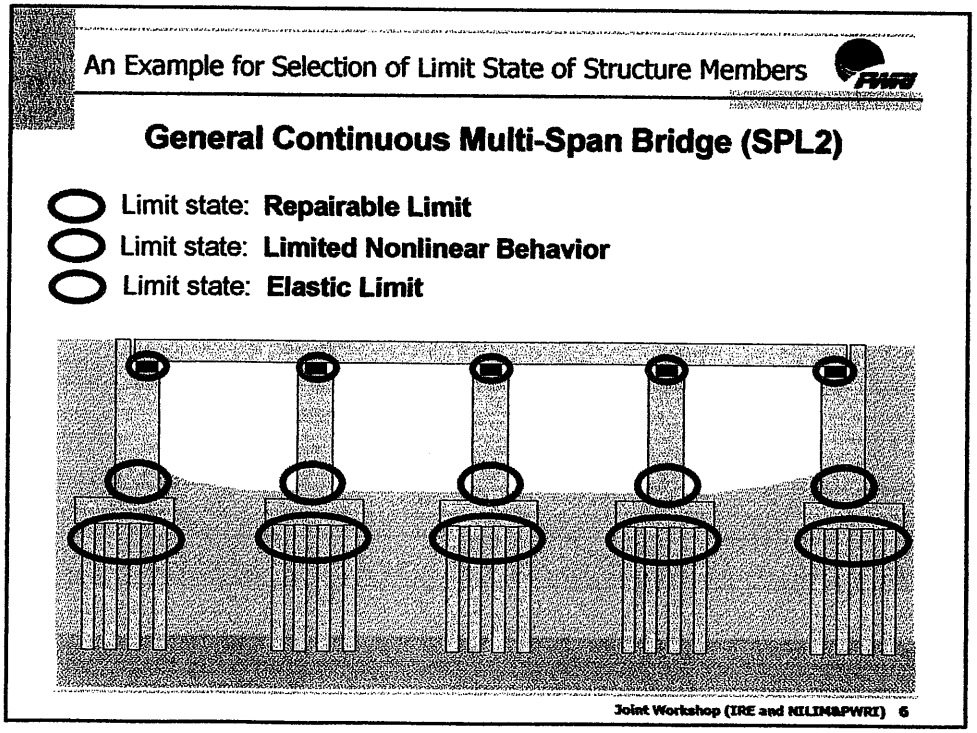
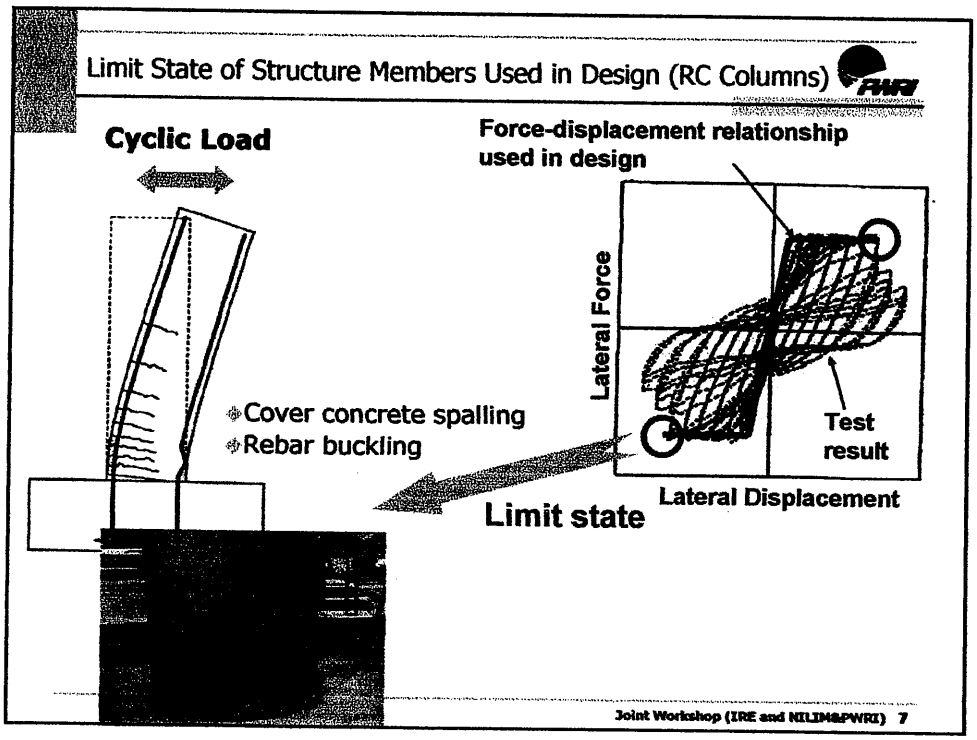
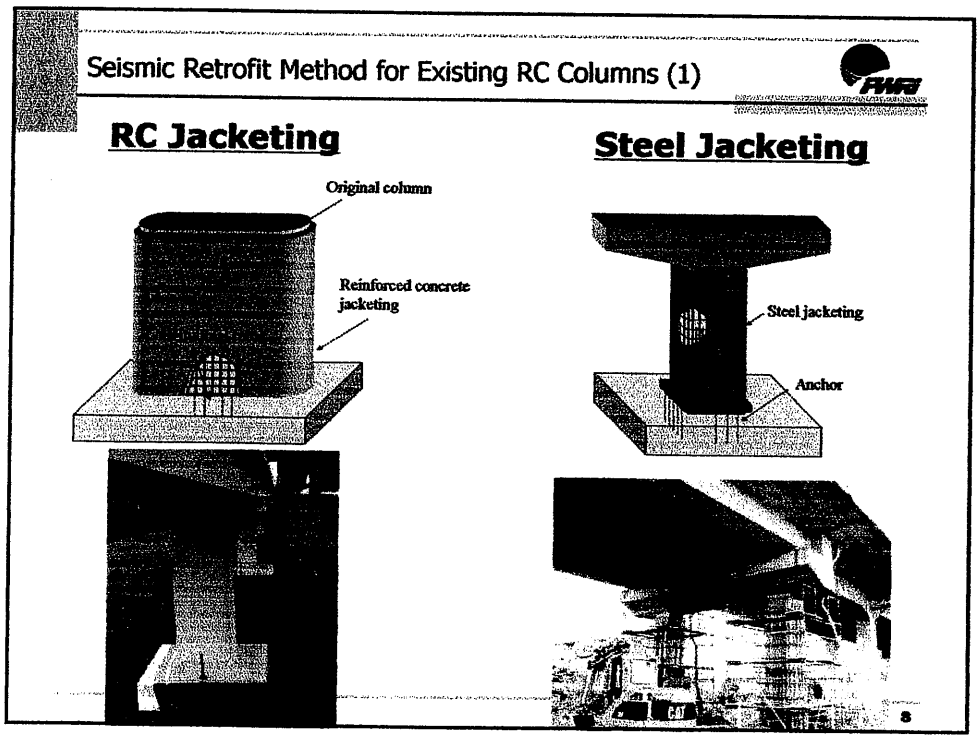

The 1995 Hyogo-ken Nanbu Earthquake
January 17, 1995
Hyogo-ken Nanbu Earthquake
M=7.2
TOKYO
Joint Workshop (IRE and NILIM&PWRI) 3

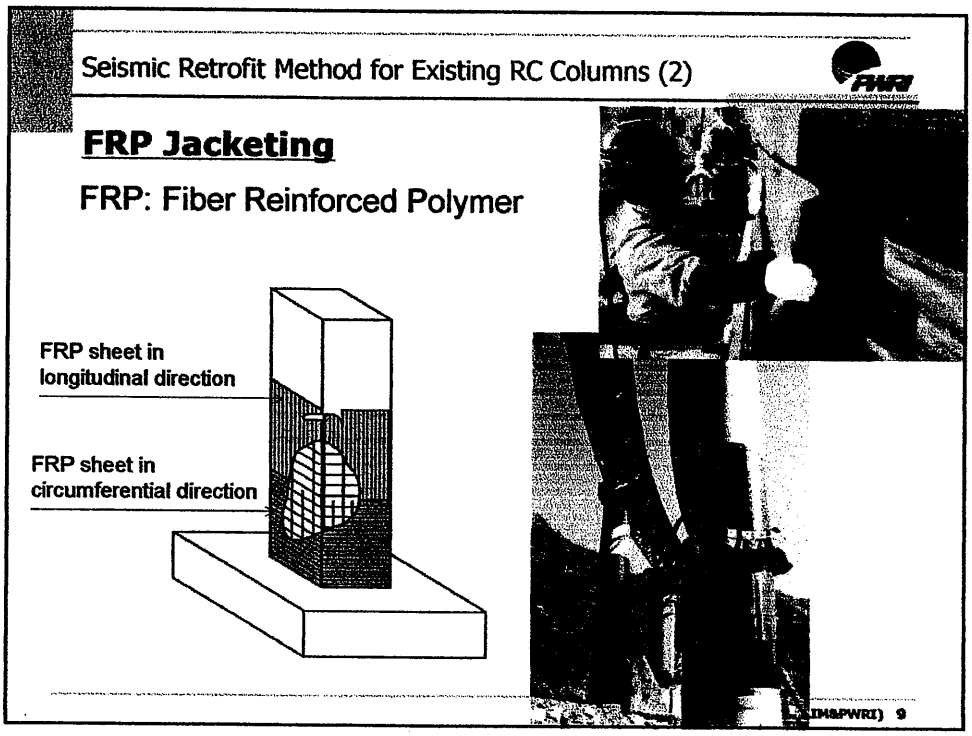

Examples of the Current Design Ground Motions
Type II Hard Soil
(JMA Kobe NS)
Type II Moderate Soil
(JR Takatori NS)
Original ground motion
Design spectrum
Acc. (gal)
Time (sec)
Response Spectra (gal)
Natural Period (sec)
Joint Workshop (IRE and NILIM&PWRI) 4

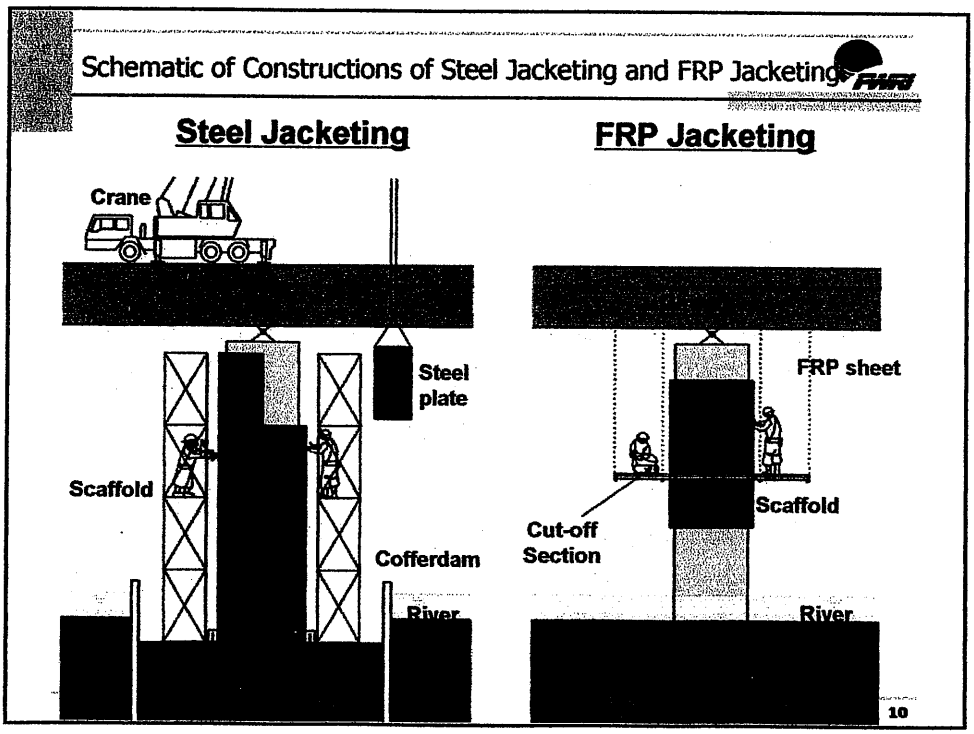

Limit States of Bridges
Lateral Force
SPL: Seismic Performance Level
Lateral Displacement
SPL 1
Elastic Limit
SPL 2
Repairable Limit
Ductility Capacity Limit
Lateral Force
Nonlinear
Lateral Displacement
Joint Workshop (IRE and NILIM&PWRI) 5


An Example for Selection of Limit State of Structure Members
General Continuous Multi-Span Bridge (SPL2)
Limit state: Repairable Limit
Limit state: Limited Nonlinear Behavior
Limit state: Elastic Limit
Joint Workshop (IRE and NILIM&PWRI) 6


Limit State of Structure Members Used in Design (RC Columns)
Cyclic Load
Force-displacement relationship used in design
Lateral Force
Test result
Lateral Displacement
Cover concrete spalling
Rebar buckling
Limit state
Joint Workshop (IRE and NILIM&PWRI) 7

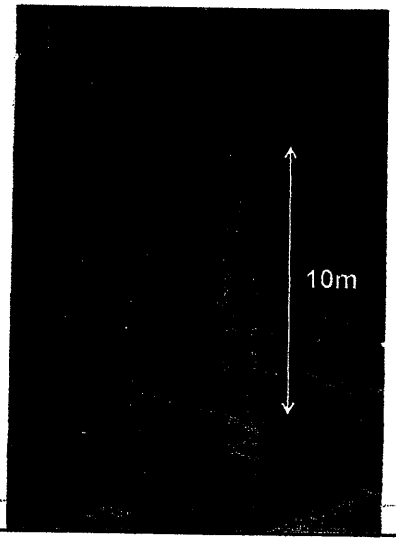

Seismic Retrofit Method for Existing RC Columns (1)
RC Jacketing
Steel Jacketing
Original column
Reinforced concrete jacketing
Steel jacketing
Anchor
8

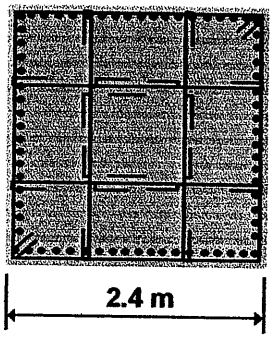

Seismic Retrofit Method for Existing RC Columns (2)
FRP Jacketing
FRP: Fiber Reinforced Polymer
FRP sheet in longitudinal direction
FRP sheet in circumferential direction
9


Schematic of Constructions of Steel Jacketing and FRP Jacketing
Steel Jacketing
FRP Jacketing
Crane
Steel plate
Scaffold
Cofferdam
River
FRP sheet
Scaffold
Cut-off Section
River
10

Experimental Verification (1)

Quasi-static cyclic loading tests of full scale RC column

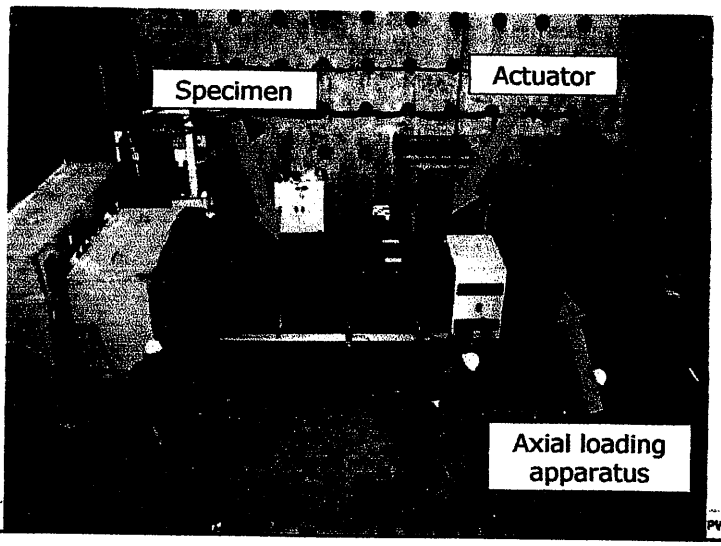




Joint Workshop (IRE and NILIM&PWRI) 11

Experimental Verification (2)

Quasi-static cyclic loading test of RC column specimen retrofitted with steel jacketing



PWRI) 12

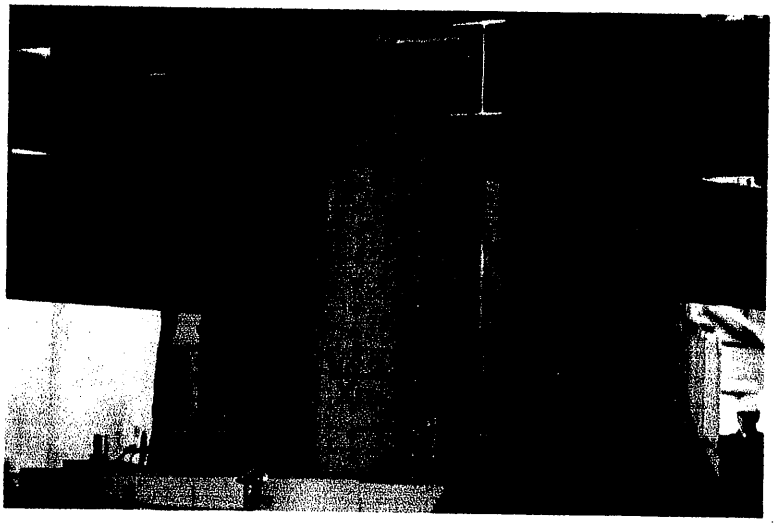
Experimental Verification (3)

Dynamic loading test of RC column specimen

Joint Workshop (IRE and NILIM&PWRI) 13

Experimental Verification (4)

RC column specimen failed in shear



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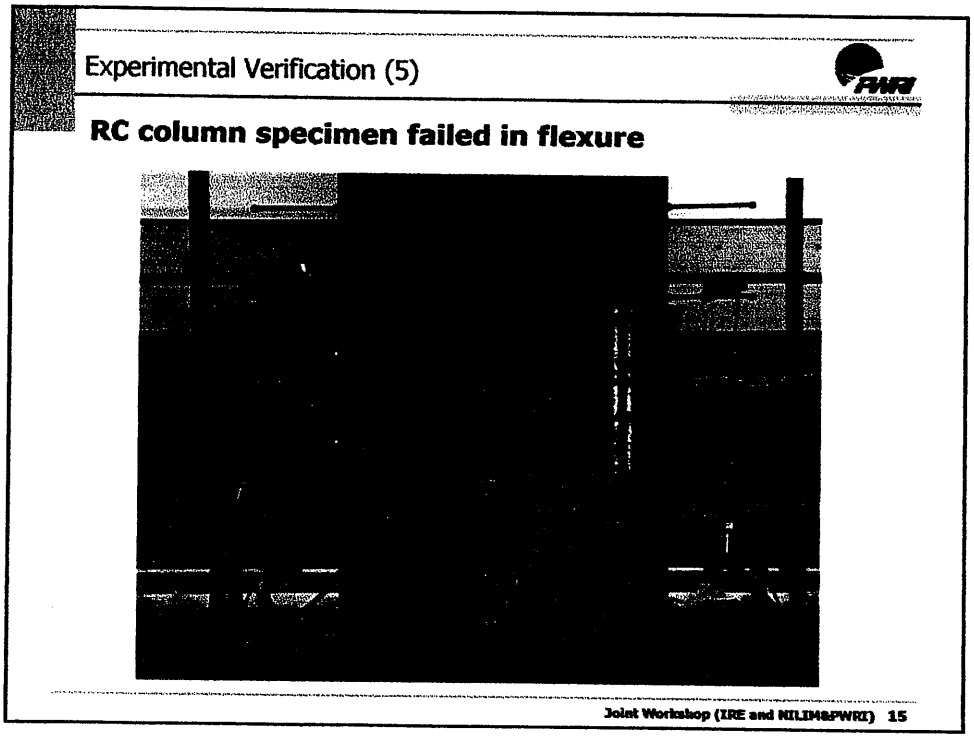
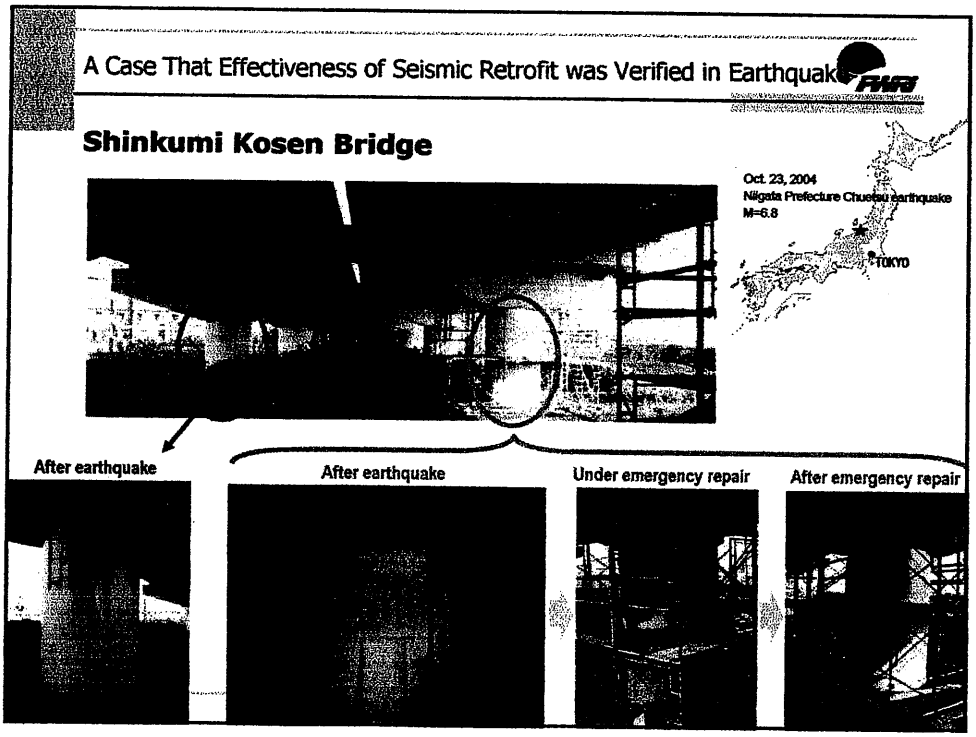

Experimental Verification (5)
PWRI
RC column specimen failed in flexure
Joint Workshop (IRE and NILIM&PWRI) 15


A Case That Effectiveness of Seismic Retrofit was Verified in Earthquake
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Shinkumi Kosen Bridge
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Niigata Prefecture Chuetsu earthquake
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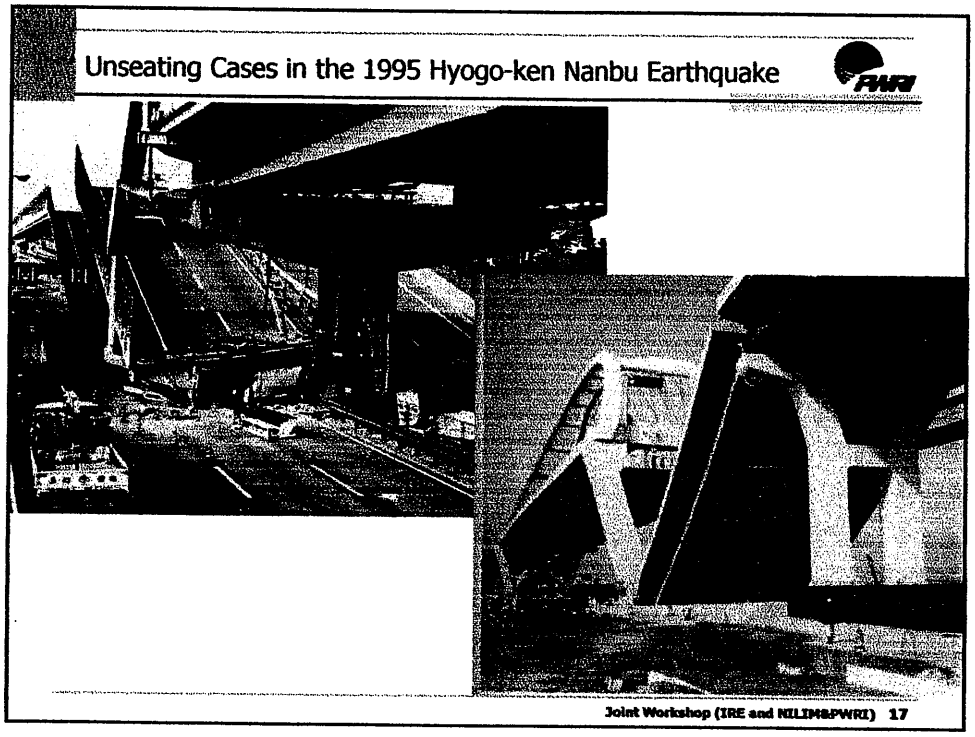
TOKYO
After earthquake
After earthquake
Under emergency repair
After emergency repair


Unseating Cases in the 1995 Hyogo-ken Nanbu Earthquake
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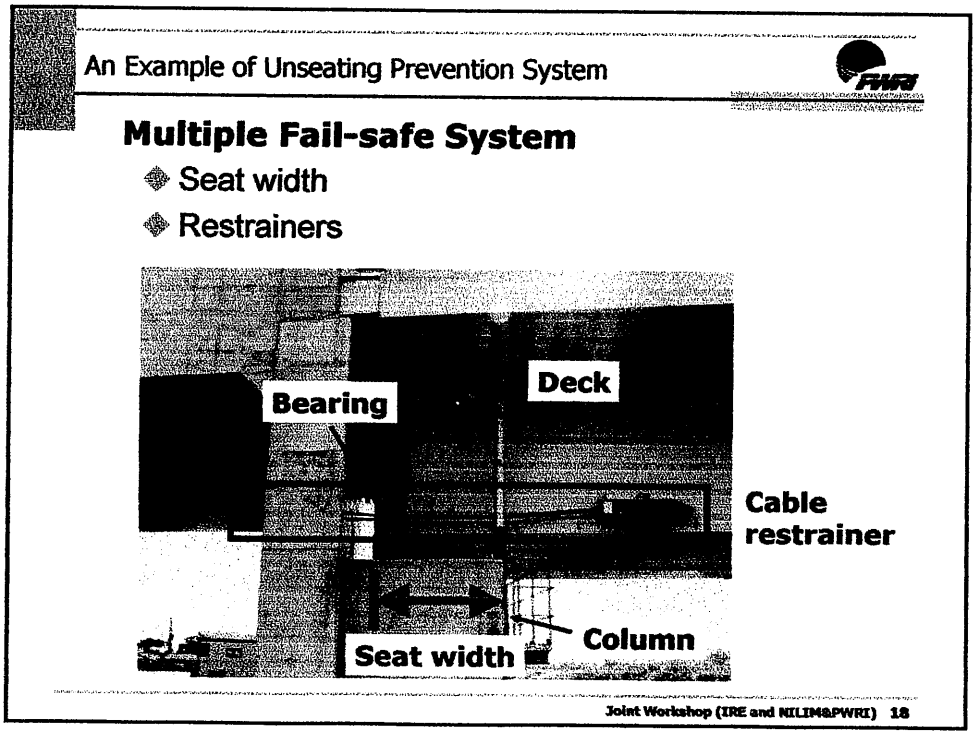
An Example of Unseating Prevention System
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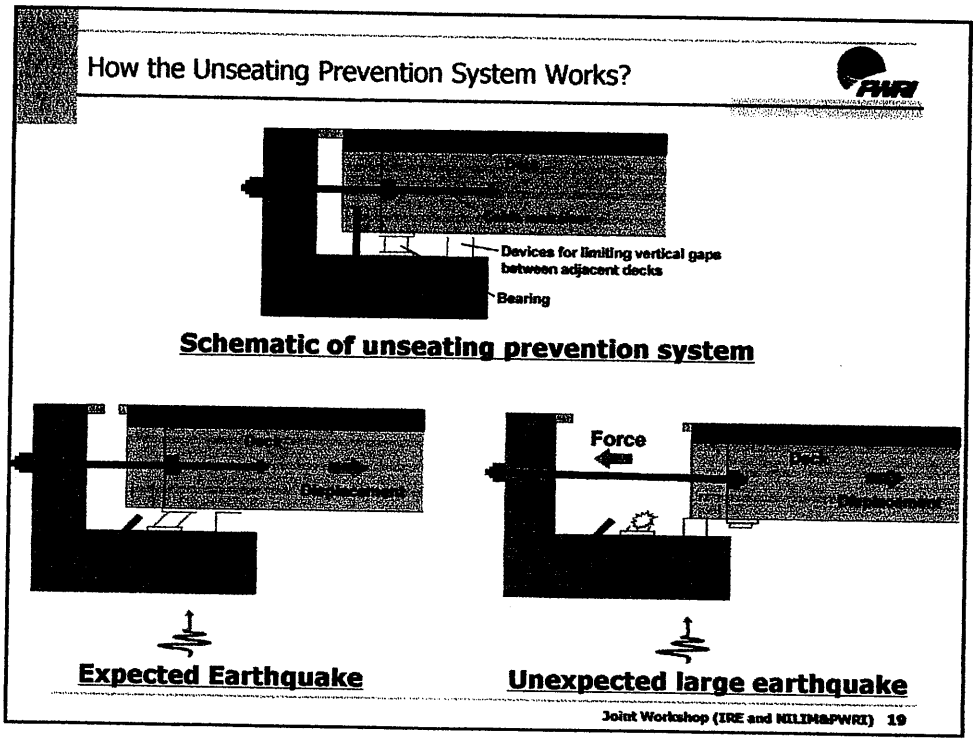
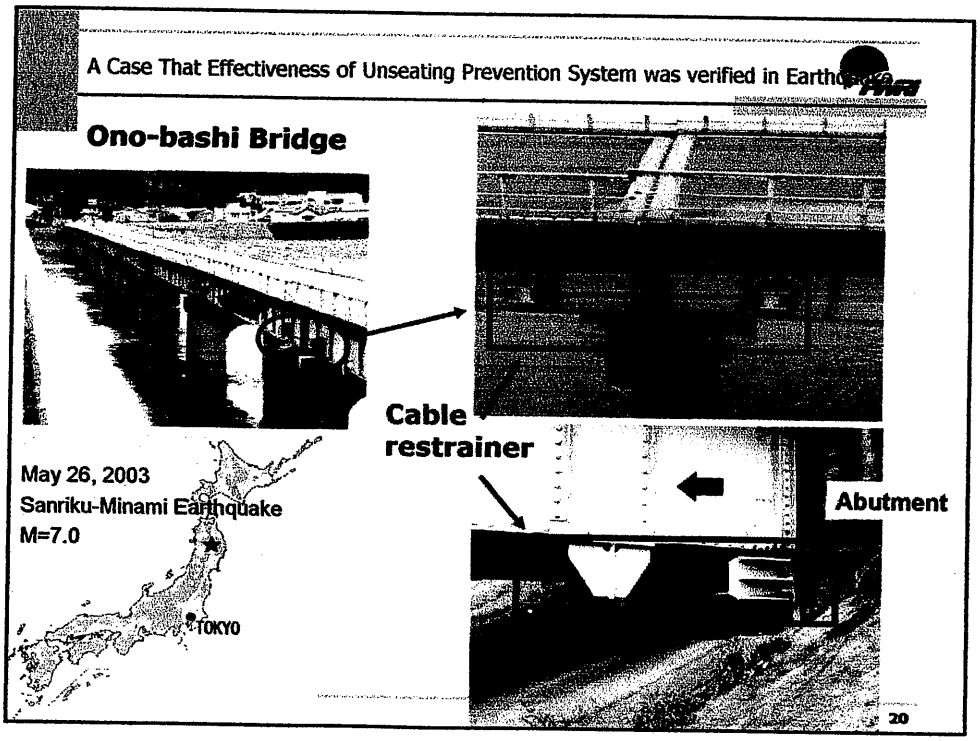
Multiple Fail-safe System
Seat width
Restrainers
Bearing
Deck
Cable restrainer
Seat width
Column
Joint Workshop (IRE and NILIM&PWRI) 18


How the Unseating Prevention System Works?
Devices for limiting vertical gaps between adjacent decks
Bearing
Schematic of unseating prevention system
Force
Expected Earthquake
Unexpected large earthquake
Joint Workshop (IRE and NILIM&PWRI) 19


A Case That Effectiveness of Unseating Prevention System was verified in Earth
Ono-bashi Bridge
Cable restrainer
Abutment
May 26, 2003
Sanriku-Minami Earthquake
M=7.0
TOKYO
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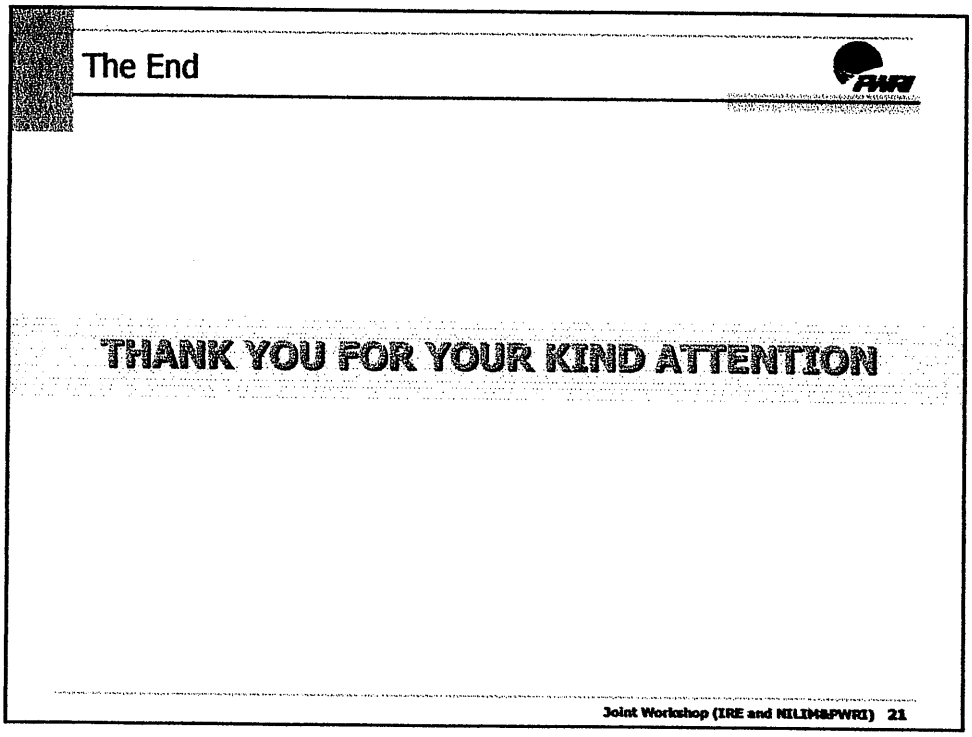
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THANK YOU FOR YOUR KIND ATTENTION
Joint Workshop (IRE and NILIM&PWRI) 21

REVIEW OF BRIDGE CONDITION POST EARTQUAKE DISASTER

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Abstract

From geological aspects the Indonesian archipelago is formed by collision between large tectonic plates. Collision of Eurasia and India-Australia plates influence the western part of Indonesia, while on the eastern part of Indonesia these two plates collide again with the Pacific plate from eastern direction. These movements cause the seismic risk and volcanic conditions in Sumatra, Java, Flores, Maluku, Sulawesi and Irian Jaya islands.
This report describes the investigation results of post earthquake damage on the bridge infrastructure during the last five years, with a magnitude of more than six on the Richter scale in several regions of Indonesia, like Nabire, Aceh, Nias, Yogyakarta, Bengkulu, West Java and West Sumatra.
The earthquake damage in bridges is generally comprising of :

- *Movement of superstructures in lateral direction*
- *Increase of lateral dilatation between old bridge and new widened bridge*
- *Slumping of the approach embankment to the bridge*
- *Cracking/splitting of wing walls at abutments*

I. INTRODUCTION

Earthquake is one of the natural phenomena that frequently occurs, and anytime earthquakes could hit even with or without prediction. Earthquakes always cause damage regardless of their great or small magnitudes. Damage is also caused by other natural disasters that are triggered by the earthquake, like earth sliding, damage of buildings, and even loss of human life.

If an earthquake damages infrastructure facilities like roads and bridges, then the economical activities in that region are disturbed due to transportation obstructions. This is another aspect of post earthquake loss.

Based on geological aspects, some regions in Indonesia have a high risk for the occurrence of great/massive quakes. During the last five years several earthquake disasters with magnitudes above six on the Richter scale caused damage to bridge structures in following regions :

1.Nabire (7 February 2004, 6,8 SR)

2.Aceh (26 December 2004, 9,3 SR, Tsunami)

3.Nias (28 March 2005, 8,7 SR)

4.Yogyakarta (27 June 2006, 6,2 SR)

5.Bengkulu (12 September 2007, 7,9 SR)

6.West Java - Southern part (2 September 2009, 7,3 SR)

7. West Sumatera (30 September 2009, 7,6 SR)

Based on investigation studies on several bridges, the type and extent of post earthquake damage on bridges in Indonesia can be revealed.

Generally, there are several post earthquake typical damage on bridge as follow :

- Lateral movement of bridge superstructure.
- Lateral dilatation between main superstructure and added superstructure.
- Settlement of bridge approach road embankment.
- Cracks on retaining wall and abutments.

II. GEOLOGICAL CONDITION OF INDONESIA

The Indonesian archipelago is one attractive region by the geological conditions. Attractive because of the formation of the group of islands by collision of large tectonic plates. Collision of Eurasia and India-Australia plates influences the western part of Indonesia, while on the eastern part of Indonesia these two plates collide again with the Pacific plate from eastern direction.

Figure 1 Tectonic condition of Indonesian archipelago

The red, orange and green lines show the borders of tectonic plates. The red line shows the widening of the oceanic floor. The orange line shows the relatively horizontal faulting, while the green line shows collision between tectonic plates. These moving condition as shown in Figure 1 has an impact on life and nature on these plates. Sulawesi island has one of the worst conditions by the collision between three plates.

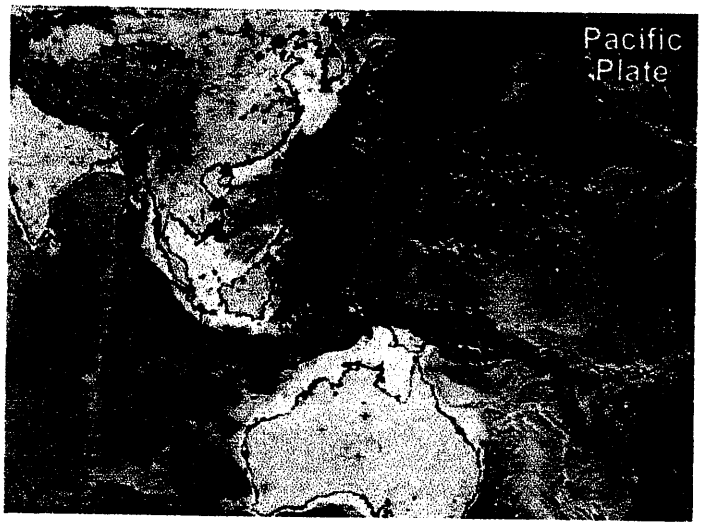


Figure 2 The ring of volcanoes and epicenter locations in the Indonesian archipelago.

The red line on Figure 2 shows the ring of fire/volcanoes, the purple points are earthquake centers, and yellow stars are hot spots. These tectonic activities cause the seismic risk and volcanic conditions in Sumatra, Java, Flores, Maluku, Sulawesi and Irian Jaya islands. Only Kalimantan island is relatively free from earthquake risks.

III. REVIEW OF SEVERAL POST EARTHQUAKE DAMAGE OF BRIDGES IN INDONESIA

The bridge damage pattern is in general as follows :

- Movement of bridge superstructures in lateral direction
- Increase of lateral dilatation between old bridge and new widened bridge
- Slumping of the approach embankment to the bridge
- Cracking/splitting of wing walls at abutments

Typical earthquake damage in some regions of Indonesia is described as follows :

A. Aceh Earthquake

On December 26th 2004, a massive earthquake in the Indian ocean occurred, near the west coast of Aceh. The earthquake was at 7:58:53 WIB (West Indonesian Time). The epicenter was at 3.316° N 95.854° E about 160 km from western Aceh with a hypocenter depth of 10 kilometer. The magnitude was 9,3 according Richter Scale and it was the most massive earthquake of the past 40 years. This quake also caused tsunami, spreading to 8 countries and about 230.000 persons died.

In general the national road was damaged along the coast where the tsunami passed the coast line by about 2-3 km into land. Damage locations in some places were so severe that road and bridge segments could not be identified.

The following figures show that for locations far from the coast, roads and bridges are undamaged. While in some locations the damage is caused by falling of the superstructure from the substructure, that was still existing, scouring of the approach embankment to the bridge, and widening of the river on both sides.

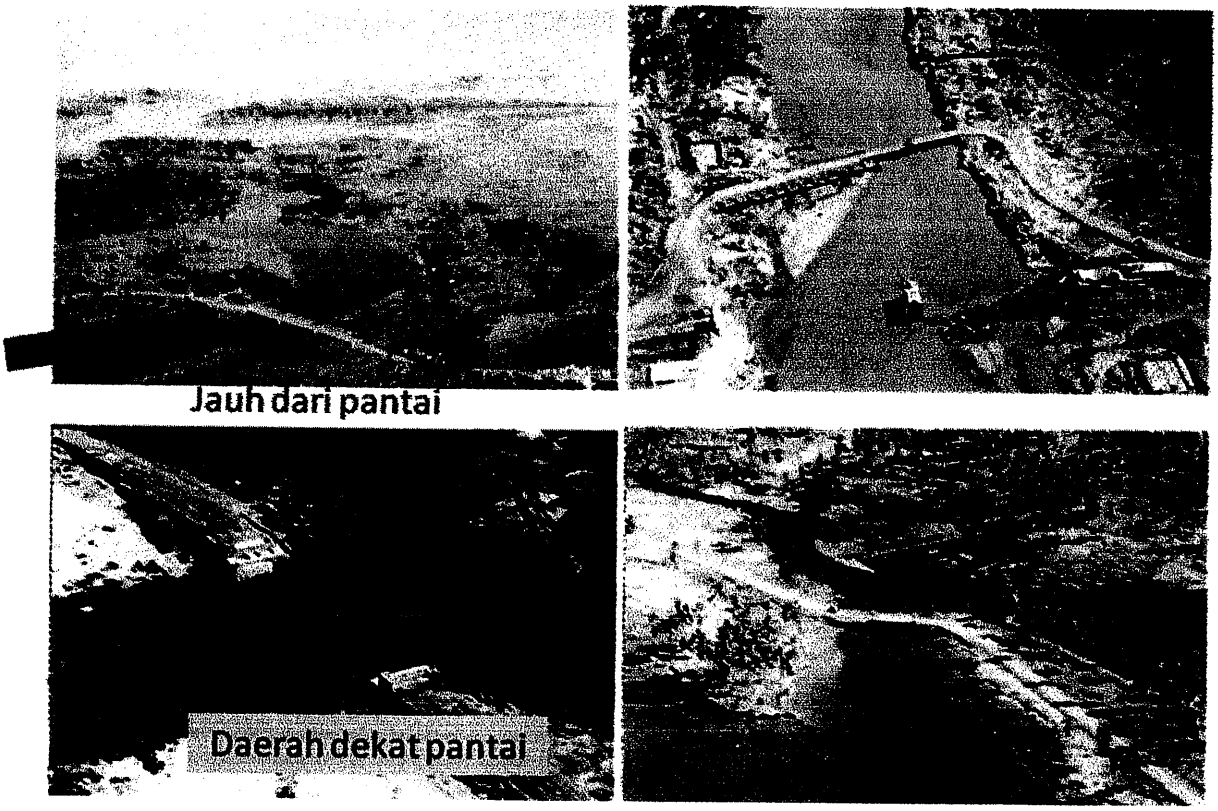


Figure 3. General road and bridge conditions after tsunami

Some bridges were swept away by the sea waves :

a. Sua Ujong Kalak Bridge

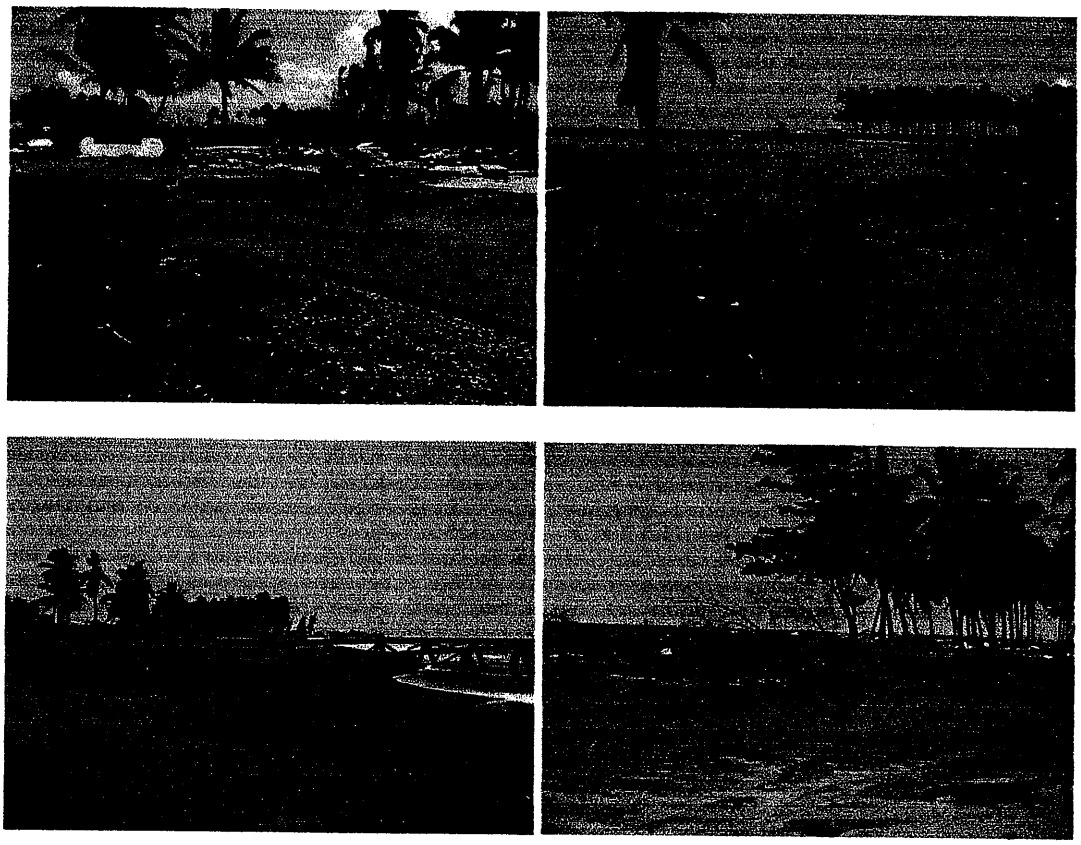


Figure 4. Sua Ujong Kalak bridge condition , link Banda Aceh-Meulaboh, KM 241,9

b. Kuala Bubon Bridge

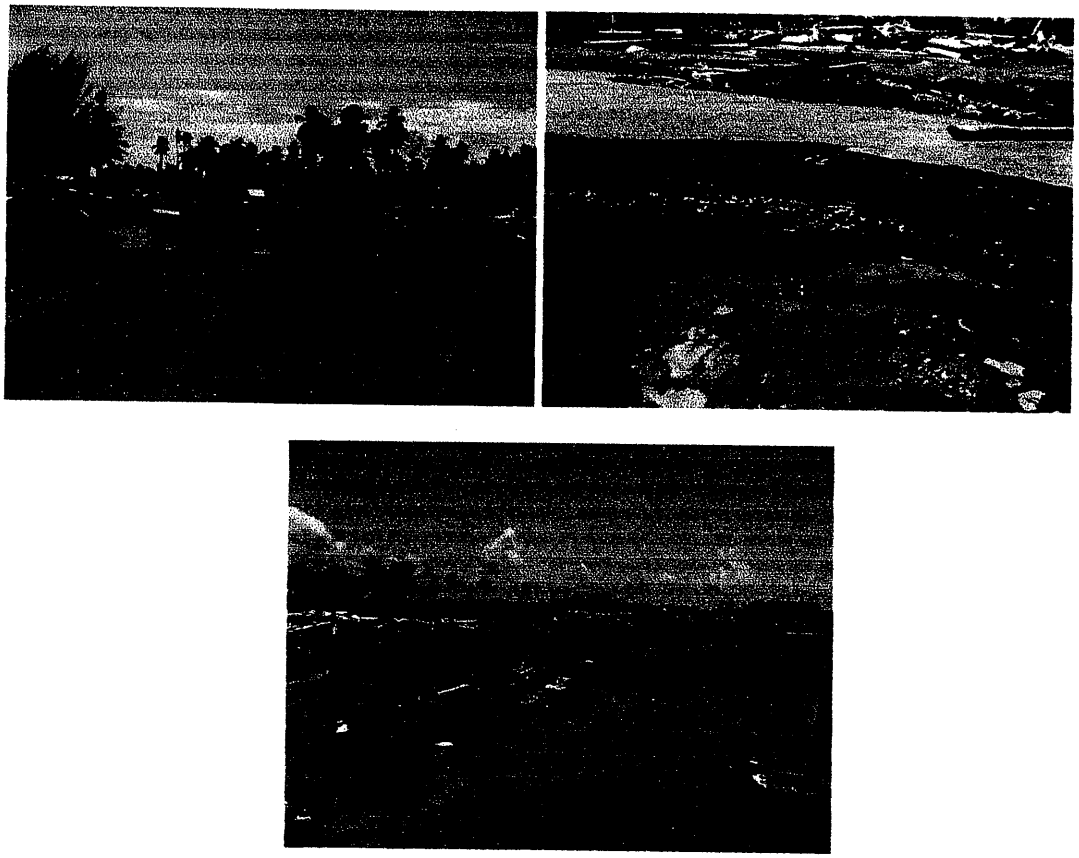


Figure 5. Kuala Bubon bridge condition, link Banda Aceh-Meulaboh, KM 235,7

Some bridges were destroyed :

Suak Ujong Kala II bridge

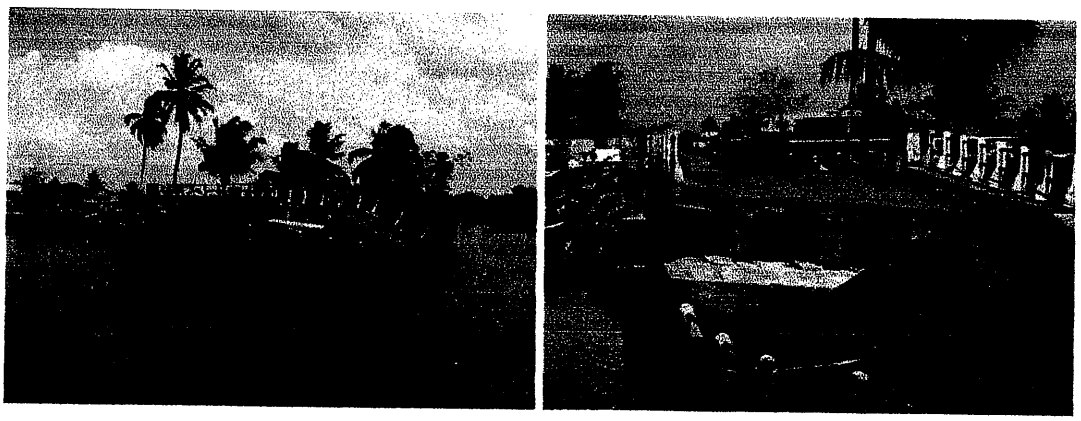


Figure 6. Suak Ujong Kala II bridge condition , link Meulaboh-Sumbar

B. Bengkulu Earthquake

Bengkulu earthquake 2007 was a series of quakes in the Java sea near the coast of Bengkulu and Sumatra. This quake caused a tsunami warning along the coasts of the Indian ocean, that was later dismissed.
The initial earthquake had a magnitude of 7.9 SR, occurred on 12 September 2007 at 18.10 WIB (West Indonesian time). The hypocenter depth was about 10 km, about 105 km from the coast of Sumatra, or about 600 km from the capital Jakarta.

The bridge conditions after earthquake were in general as follows :

- lateral bridge movement due to lateral earthquake forces
- Slumping of the approach embankment because there was no retaining wall at the bridge abutment.

1. Lais Besar Bridge

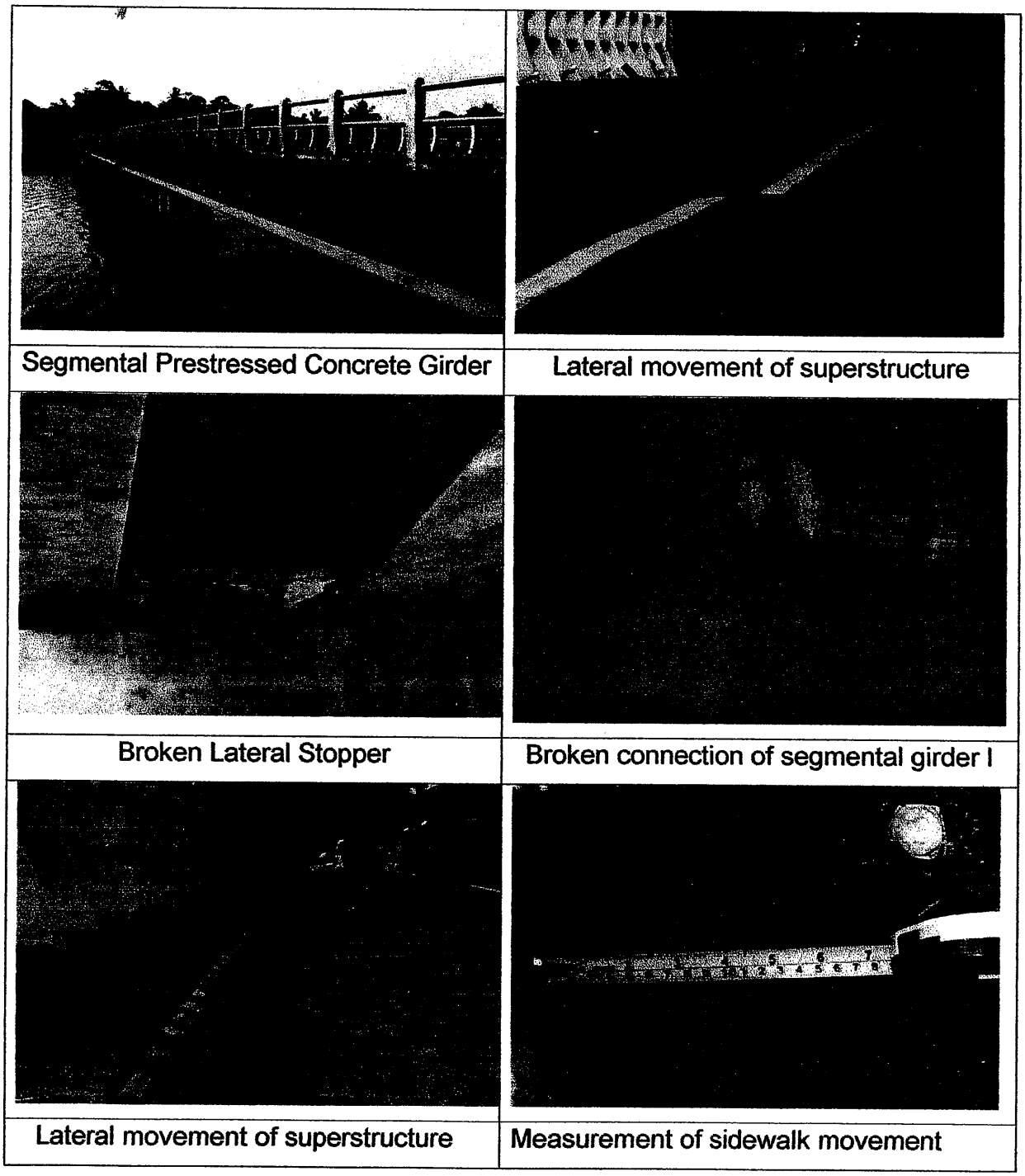


Figure 7. Damage of Lais Besar bridge

2. Sebelat bridge

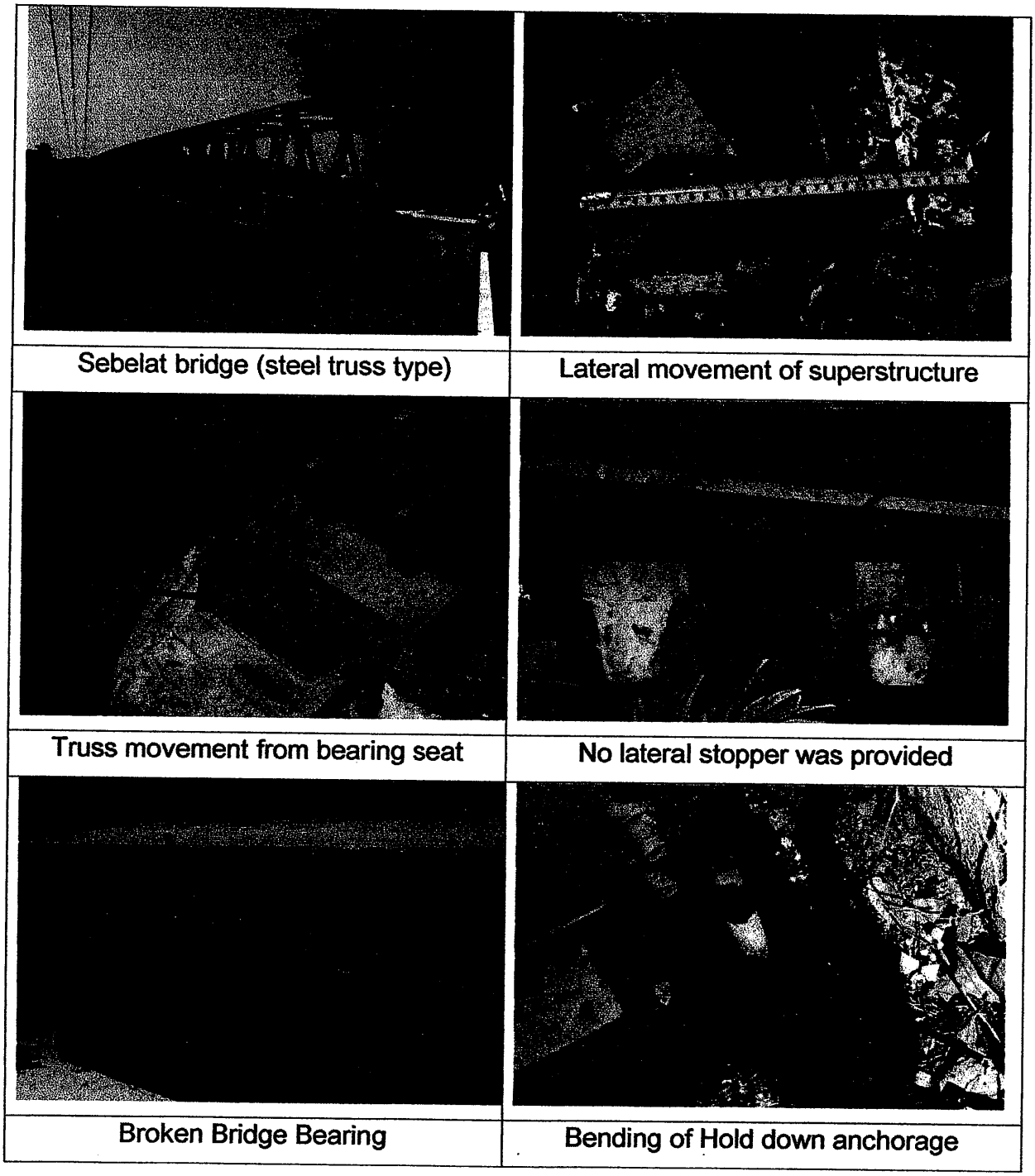


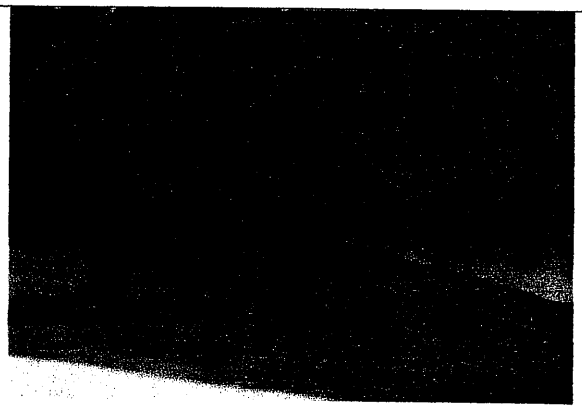
Figure 8. Damages of Sebelat Bridge

3. Kalikut Bridge

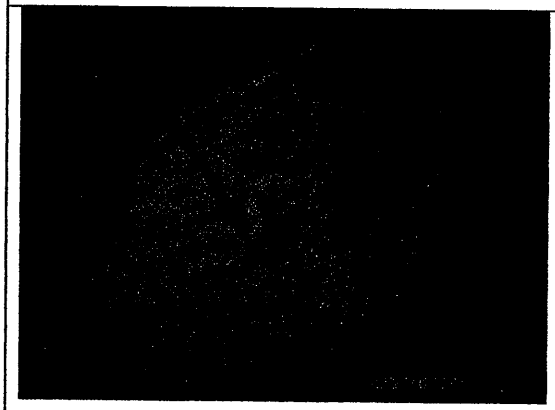
Kalikut bridge(slump of approach road)

Retaining wall sag

Slumping of approach road



Lateral stopper has no bolt



Retaining wall cracking damage

Exposed foundation due to slumping of soil

Figure 9 Damages of Kalikut Bridge

3.3 West Sumatera Earthquake

West Sumatera Earthquake on 2009 occurred with a magnitude of 7,6 Richter Scale near the coast of West Sumatra on 30 September 2009 at 17:16:10 WIB (west Indonesian time). The earthquake location was near the coast of Sumatera, about 50 km from Padang City. The quake caused serious damage in several regions of West Sumatra like Kabupaten Padang Pariaman, Padang city, Kabupaten South Pesisir , Pariaman city, Bukittinggi city, Padangpanjang city, Kabupaten Agam, Solok city, and Kabupaten West Pasaman . According to the data of local authorities (Satkorlak PB), at least 1.117 persons died by this quake involving 3 cities & 4 kabupaten in West Sumatera , heavy injured people achieve 1.214 persons, light injured 1.688 persons, 1 person was not found. Besides that 135.448 houses were heavily damaged, 65.380 houses fairly damaged, & 78.604 houses lightly damaged[(3)].

The general bridge condition after the West Sumatra earthquake is as follows :

- Lateral dilatation occurred between the old bridge and the new widened bridge structure a **Titian panjang bridge**
- The soil of the approch road slumped because there was no retaining wall at the abutment

Figure 10. Gap between old and new widened structure at Titian Panjang bridge

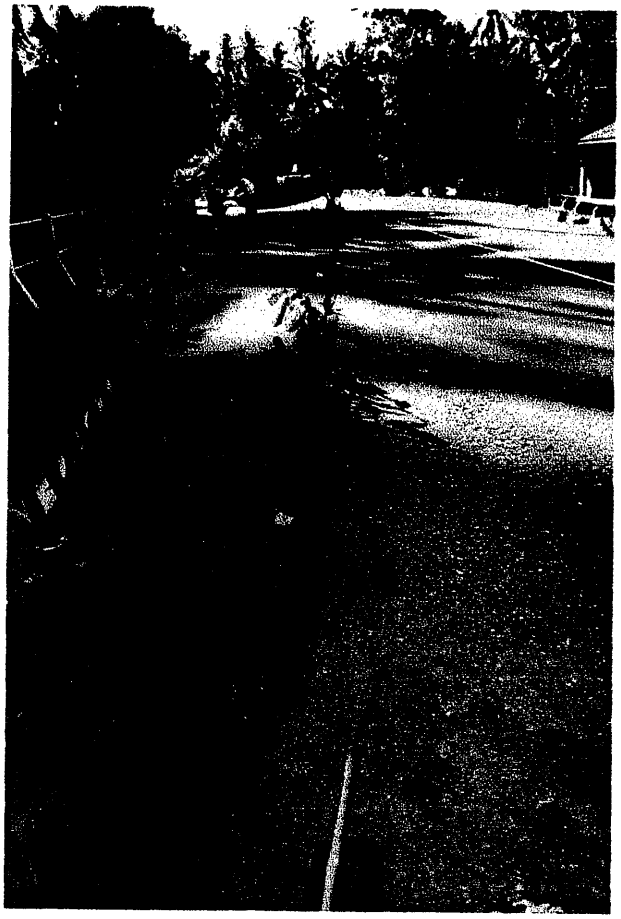


Figure 11. Hole at bridge approach embankment

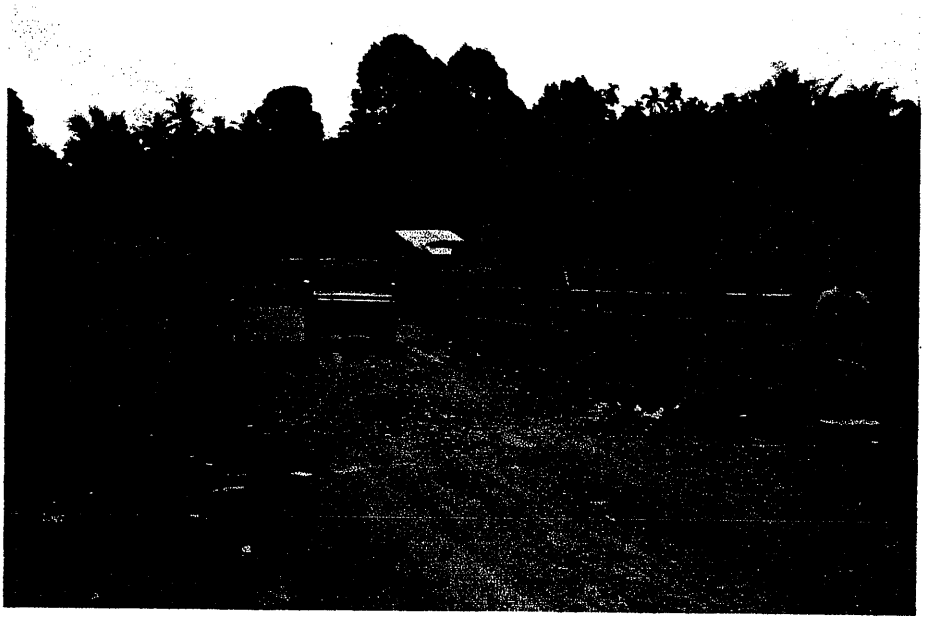


Figure 12. Tingkok bridge

Figure 13. Hole at the approach embankment

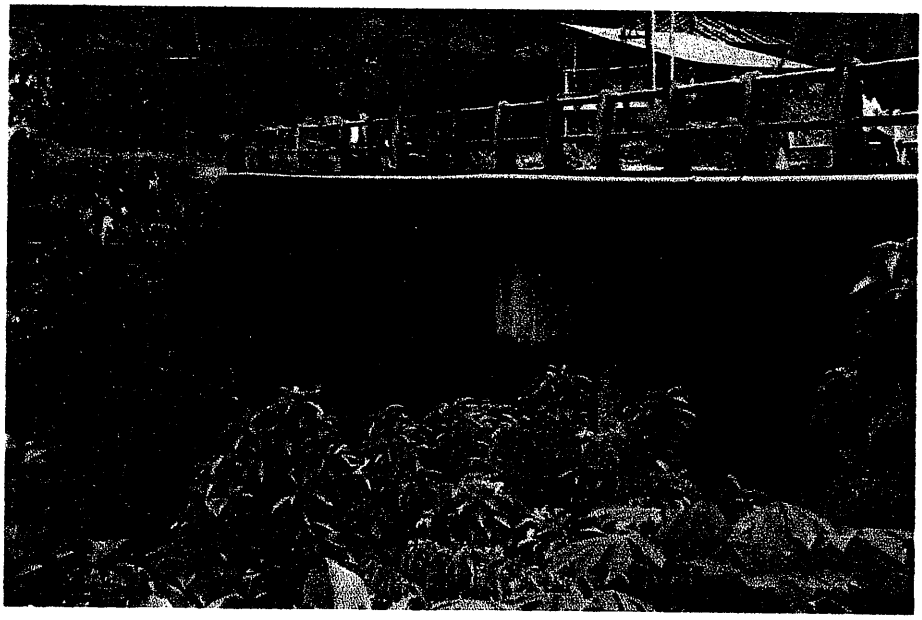


Figure14. Abutment condition of Tingkok Bridge

IV. DISCUSSION

4.1. Steel Truss Bridge

Steel truss bridge in Indonesia is designed to accommodate earthquake and builts with elements to resist lateral force (stopper), vertical force (anchorage bar) and longitudinal force (buffer), however there are several of bridges which is not installed with those elements.
Another example, steel truss bridge which only install one earthquake element on its pierheads / abutments, after an earthquake occurs, the suprastructure moved ± 20 cm laterally and causing damage to other elements. (stripped anchorage, broken/slide bearing, broken sidewalk) **(see fig. 8).**

4.2. Girder Bridge

Girder bridge in Indonesia is generally use anchorage to accommodate vertical force and lateral stopper to accommodate lateral force. On Lais Besar bridge there are no lateral stopper installed on bridge abutments,, causing the superstructures to moved ± 13 cm horizontally, crack on the concrete diaphragm and crack on wingwall (see fig. 7).
The following figures showing bridge damages caused by lack of lateral stopper.

3. Research, development and dissemination related to design of earthquake resistance.

V. REFERENCES

1. IRE, 2004, *Post Earthquake Survey Report on Damage of Bridge Structures (Aceh)*
2. IRE, 2007, *Post Earthquake Survey Report on Damage of Bridge Structures (Bengkulu)*
3. IRE, 2009, *Post Earthquake Survey Report on Damage of Bridge Structures (West Sumatra)*

THE NEED AND DEVELOPMENT FOR BRIDGE STRENGTHENING TECHNOLOGY IN INDONESIA

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ABSTRACT

The reasons leading to structural damage of existing bridges are mainly the decrease of load carrying capacity and/or increase of load factors. Bridge strengthening is focussed on repair of structural damage and deterioration. Therefore knowledge and knowhow are important as capacity and durability can only be achieved if the cause of damage and deterioration of the concrete and steel bridges is counteracted by the strengthening process.

Maintenance is the decisive factor influencing the bridge resistance and durability. Inadequate routine maintenance influences the degradation rate of the bridge even if the structure is well constructed with the use of materials and elements of high quality.

Besides above reasons, damage can be caused by the structural model. Failures like fatique of concrete and steel are frequently assessed and simplified by implying load factors in the ultimate limit state design. By using load factors, the possibility of reasonable deviations in design and construction is considered.

Typical damage cases with their remedial actions for concrete and steel bridges are described in more detail in this paper. The case study of the Sei Kedang Pahu bridge strengthening is incorporated to show the wide scope of an actual remedial action.

I. INTRODUCTION

1.1 Background

Roads and bridges furnish the land transportation network. A bridge connects two points on dry land by crossing a river or sea. Bridges are feasible in becoming damaged like other structures. Damage cases are caused by :

1. Lack of maintenance
2. Insufficient construction quality
3. Environmental effects
4. Overloading / non-standardized dimension

5. Change of road function

Structural damage of existing bridges is mainly caused by the decrease of load carrying capacity and/or increase of load factors. Bridge strengthening is one repair method to counteract structural damage. Therefore knowledge and knowhow are important as capacity and durability of the bridge strengthening process can only be achieved if the cause of damage of the concrete and steel bridges is made invalid. Besides above reasons, damage can also be induced by the structural model design. Fatique of concrete and steel is assessed in the ultimate limit state design by the implementation of load factors. Ultimate limit state is a simplified fatique design. Therefore a failure proofed design is rarely achieved.

1.2 Case problems

Based on the facts of the above background, some case problems are as follows:

1. Various typical damage in bridges structures
2. Various types of structural bridge strengthening methods
3. Fatique effects on concrete and steel bridge structures

1.3 Aim of the program

1. Various typical damage in bridge structures with their appropriate strengthening methods
2. More information about the fatique effect on the bridge structure, in particular for concrete structures

1.4 Research Methodology

Based on the expected achievement, the research method is performed in stages as follows :

1. Literature study of reference material in connection with various typical structural damage in bridges and their appropriate strengthening methods. Besides this, the fatique of concrete with the influence of different concrete grades on the Young's modulus is studied from reference sources. Fatique of steel with consistent Young's modulus for all steel grades is already well known and established according to the Miner's Theory.

2. A case study of Sei Kedang Pahu bridge is described to evaluate the structural damage and the appropriate strengthening method.

2. Reference Overview

2.1 Typical damage in bridge structures

Each bridge structure is effected by the load types dan other effects from vehicle live load besides exposure to weather and environmental conditions like natural phenomena.

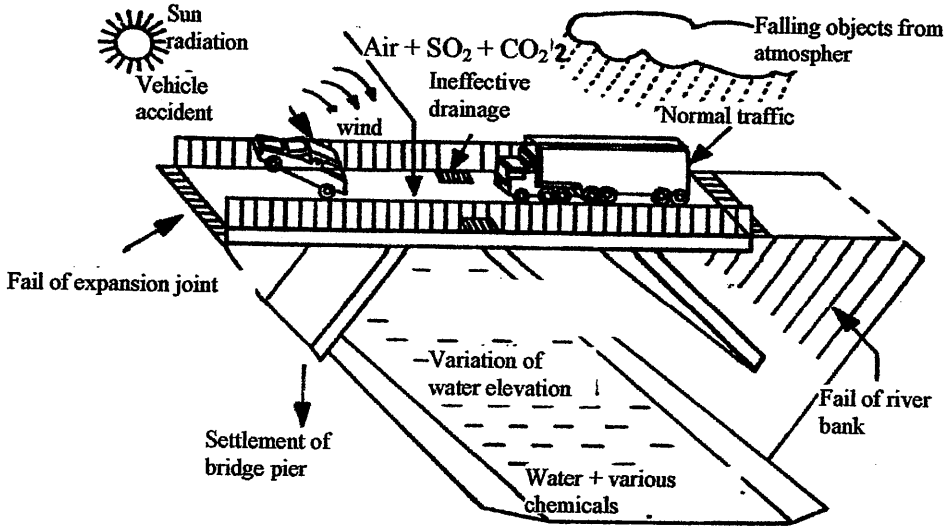


Figure 2.1 Factors effecting the bridge in service

The factors that cause bridge damage are classified in four basic groups as follows :

1. Inner factors,
2. Traffic load factors,
3. Weather and environmental factors,
4. Maintenance factors.

Inner factors are inherent with the structure itself. This means that the structure can contain some factors that cause degradation or particular sensitivity to damage, for example design errors including structural system, quality of materials, aging factor etc.

Traffic load factors, It is a fact that intensity and speed of traffic as well as heavy vehicle load concentration and dynamic effects are increasing and developing since the last few decades. Many existing bridges are not upgraded and become insufficient in capacity to support these conditions. It must also be notified, if static axle loads do not increase, then the axle distances are nearer. The resulting concentrated loads can overstress certain bridge elements. Usage conditions can also change the live load to an other type, that is different from the previous design assumptions.

Weather and environmental factors are part of the climate and atmospherical nature. Some examples like seasons and change in daily temperatures, rain fall or wind pressure, may be classified as objective ones. These factors are directly independent of human activities in the field of bridge engineering, while others. (for example : atmospheric pollution, aggressive chemicals in ground water or in the river) are dependent on human activity in the field of bridge engineering. It should be emphasized that bridges are not covered by roofing and therefore they are exposed to weather and environmental attack. These effects are more important for durability of the bridge structure than traffic load effects. Thereby only certain factors are included in design, such as temperature differentials and wind pressure are standard design parameters. A majority of climatic and environmental factors are not considered in design and it is very difficult to predict their development in time and influence on the structural damage (for example , atmospheric pollutions or aggressive chemicals in rivers).

Maintenance factors are entirely related to quality and intensity of protective measures, such as anti-corrosive protection, current conservation works, cleaning etc. Maintenance is the decisive factor influencing the bridge resistance and durability. Inadequate routine maintenance influences the degradation rate of the bridge even if the structure is well constructed with the use of materials and elements of high quality. Therefore, the maintenance factor is part of the human activity in bridge engineering itself.

2.1.1. Typical damage of concrete structures

Damage of concrete structures is mainly revealed by visual inspection of crack types. Damage of concrete can be caused by :

- Inadequte design and/or construction
- Structural cracking/ excessive deflection in structural components
- Inadequate material quality
- Degradation in structural capacity
- Weathering and aging, chemical attack
- Fire attack, earthquake or floods.

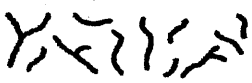
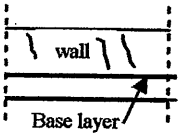
In the evaluation of cracking influence on the bridge resistance and safety, it is important to investigate the cause of cracking. Cracking is mainly caused by the following factors :

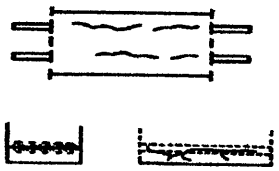
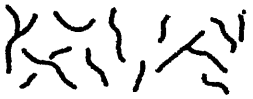
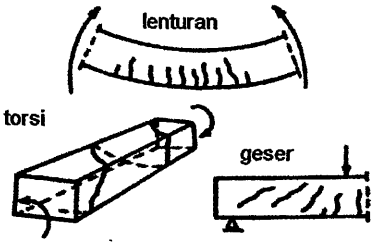
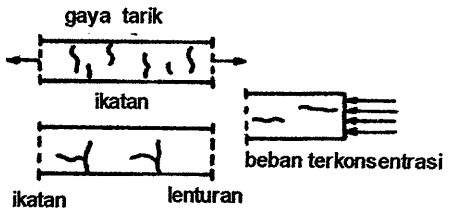
(i) Initial crack formation after casting the concrete or construction of the structure

(ii) External crack appearance or pattern

(iii) Crack width, number and location

Tabel 2.1 Cause and appearance of cracks in concrete structures

No.	Cause	Time of formation	External appearance	Illustration	Comment (crack width w)
1	Plastic settlement (slump cracking	First few hours after casting of concrete	Cracks along reinforcing bars. Cracks at changes in shape/section		Cracks can be large (w > 1 mm)
2	Plastic shrinkage	First few hours after casting of concrete	Cracking pattern or long cracks on surface of elements cast in drying conditions		Cracks can be large (w = 2-4 mm)
3	Early thermal cracks	First few days after casting of concrete	Large cracks at construction joints in walls. Other cracks depending on restraint condition		Can be controlled by reinforcement (w < 0,4 mm) , by limiting pour sizes or temperature control
4	Shrinkage	Several months after construction	Similar to bending or tension cracks	See below (7 or 8)	Usually small if reinforcement is sufficient (w < 0,4 mm)

5	Corrosion	Several months or years after construction	Cracking along reinforcement bars developing into spalling		Initially small ($w < 0,2$ mm) increasing with time, rust staining may be visible on concrete surface in wet conditions .
6	Alkali silica aggregate reaction	Several years after construction	occurrence in wet conditions, frequently as a map of cracks, only with alkali reactive aggregates		Cracks can be large (even $w > 1,0$ mm)
7	Service loading	Depending on usage of structure			Small in general ($w < 0,2$ mm), if design for strength is satisfactory. Larger cracks indicate in general design errors
8	Restraint	Depending on external influence			Small in general ($w < 0,2$ mm), if reinforcement is sufficient

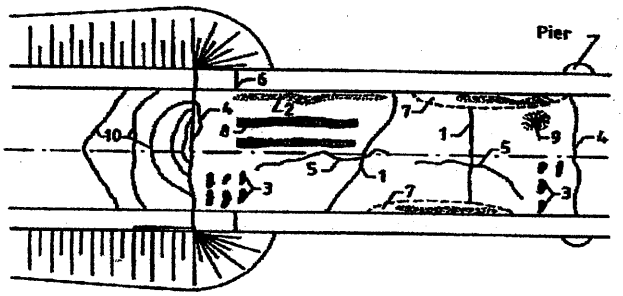


Figure 2.2 Damage in paved roadway on concrete/composite bridges

1. transversal cracks in pavement, 2. contaminations along curbs, 3. losses/defects in pavement, 4. cracks in expantion joints, 5. longitudinal cracks in pavement, 6. deterioration and leakage near curbs, 7. pavement deformation, 8. 'wheel tracks' pavement deformation, 9. pavement deterioration, 10. pavement roughness in approach zones due to setllement of embankment or lack of intermediate slab between span and abutment

2.1.2 Corrosion of steel structures

Corrosion is damage or degradation of metal caused by reaction between metal and some ions from environmental conditions resulting into corrosion products ($Fe_2O_3.nH_2O$).

Corrosion is the most common factor leading to deterioration of structural members and their joints. There are five forms of corrosion observed in steel bridges :

(a) Surface corrosion, causing uniform destruction of relatively large surface of structural steel and leading to reduction of cross sections or material losses

(b) Pitting (fatique) corrosion, occurring on very small surfaces and therefore difficult to detect. , developing deeply inside the steel and leading to local stress concentration.

(c) Crevice (fatique) corrosion, occurring in the contact layer between two elements of the same type of steel (e.g., in bolted plates, splice plates, gusset plates etc) and leading to destruction by tear forces resulting from swelling of corrosion products. This type of corrosion is difficult to detect its harmful effects as it occurs in not easily accessible places in the bridge structure.

(d) Galvanic corrosion, in general occurring in the joint of two different types of steel or metals (e.g., in welded, screw, bolt or riveted joints where the so called galvanic cell can be formed) and leading to local material destruction, in general difficult to detect.

(e) Stress (fatique) corrosion, occurrring mostly in cables of suspension or cable-stayed bridges, relatively seldom in bridges elements of carbon steeel.

Deterioration by corrosion is leading to increase of stresses in the structural members caused by loss of material and reduction of section. Reduction in structural stiffness will increase deflection and deformation, effecting the dynamic characteristicts of the bridge. Other effects of corrosion can be observed in damage of bridge bearings leading to locked bearing movement and causing local structural instability.

2.2 Strengthening of bridge structures

Bridge strengthening is in general classified into two principle criterias : (A) passive method dan (B) active method. The passive method can be defined as a strengthening method causing the redistribution of internal forces in the structure, but redistribution itself is not the main principal of this method. While the active method can be defined as a strengthening method based on redistribution that is induced on the structural forces, and the required strengthening is achieved by this redistribution method.

Both methods are described for steel bridging, according to (1) principle of the strengthening method, (2) construction time, and (3) construction costs as shown in Table 2.2.

Tabel 2.2 General classification of strengthening methods for steel bridges

	Passive method				**Active method**		
	Principle	Time	Costs		Principle	Time	Costs
P1	Enlargement of cross section of structural members	Long	Low	A1	Installation of additional strengthening members	mean	high
P2	Replacement of weak members with new ones to achieve the required load carrying capacity	Short	high	A2	External post tensioning	mean	mean
P3	External bonding of CFRP strips	Short	mean	A3	Change in supporting system	mean	low
P4	Strengthening of joints of any type, including gusset plates, by adding new plates	Short	Low	A4	Replacement of deck by a lighter system (e.g. orthotropic plate)	long	high
P5	Other methods			A5	Other methods		

To achieve optimal results of the strengthening of steel and concrete bridges, some additional repair has to be carried out as described in Table 2.3 (steel bridges) and 2.4. (concrete bridges).

Tabel 2.3 General classification for technical repair and material application of steel bridge structures

No	Type of work	Structural element	Applied repair	Applied material
1	Corrosion removal and surface cleaning	Any	Cleaning by hand brushing, sand blasting, thermal or chemical cleaning	-
2	Repair of deformed elements	Any	Mechanical method by jacking or heating method	
3	Removal of part of structural elements and structural joints, e.g. welds, rivets with defects, cracked gusset plates	Any, if necessary	By using hand methods , mechanical or thermal cutting methods	
4	Strengthening of structural element with reduced cross section by corrosion or fatigue cracks	Any, if necessary	Reinforcement by steel plates or angle profiles welded or bolted to existing profile	Steel, welding, bolts in material conformity with existing steel structure
5	Strengthening of structure after repair	Mostly main structural elements	Additional steel plates/profiles jointed to existing elements by welding/bolting	Steel, welding, bolts in material conformity with existing steel structure to avoid forming the corrosion cell
6	Installation of new elements after removal of existing ones	Any, if necessary	By welding, bolting	Steel, welding, bolts in material conformity with existing steel structure
7	Anti-corrosion protection	Any	Mostly painting, brush/spray painting	Paint systems of various types, one or more coating layers

Tabel 2.4 General classification for technical repair and material application of concrete bridge structures

No	Type of work	Structural elements	Applied repair	Applied material
1	Removal of deteriorated concrete	All structural elements	Hand chipping, pneumatic hammer saw cutting, water jet	-
2	Corrosion removal	Reinforcing steel, strands, steel bearings	Hand removal, using brush, grinding. Sand blasting	
3	Surface cleaning	Concrete and steel	Hand technique by washing, jet blast of air or water	
4	Crack repair	concrete	Depending crack width : surface coating, injection using gravitation or pressure.	Cement grout, epoxy grout
5	Bonding of repair material	concrete	Wetting repair area & applying rich mortar layer, or applying epoxy bonding coat (mostly by hand), dowelling by drilling	cement mortar or modified polymer mortar, epoxy bonding agent, steel dowels
6	Patching/ penambalan	Beton	Hand techniques	cement mortar or modified polymer mortar, concrete
7	Replacement or addition of reinforcement	Reinforcing steel	Hand techniques or welding	Reinforcement ,stirrups, laps
8	Reinforcement protection	Reinforcing steel	Hand techniques or spraying	Epoxy coats
9	Applying repair materials	concrete	Hand application , trowelling, cast by gravitational method, shotcrete, pumping	cement mortar or modified polymer mortar, concrete fibrous mortar or concrete , epoxy mortar , resin based polymer concrete
10	Surface coating and sealing	Beton	Hand techniques	For surface coating: polymer modified cement, cement modified polymer For sealing: polymer impregnation, silicates, epoxy based sealants, rubber and silicon resins, linseed oil
11	Perbaikan kerusakan akibat tumbukan	RC and PC beams or box girders	External prestressing	Prestressing tendons and sleeves

Other repair works that are carried out simultaneously with the strengthening work are as follows :

1. Repair of expantion joints to improve bridge movement
2. Repair of drainage to reduce rain water load at time of flooding
3. Repair of asphalt surface layer to reduce impact on the bridge
4. Repair of railings and utility lighting to improve safety of the main truss structure against collision with passing vehicles.

2.3 Selection of repair methods

2.3.1 Strengthening of steel truss structures by increasing cross section and replacement of weak elements

Purpose : By increasing/repair of the cross section, the inertia moment of the section will increase and finally improves the static and dynamic stiffness.

1) Pre-Stage :
   a) Measurements of dimensional cross sections in detail, where probably the distances between nodal points may differ due to change of camber in time and passing of vehicle loads.
   b) Measurement of dimension and location of existing bolts
   c) It is necessary to provide the detailing of new bolt holes to connect the old structure with the new one
   d) Providing surface corrosion protection between the inter surface of old and new structure
   e) Providing bolts with the same class/or higher class and larger lengths
   f) Providing additional equipment to resist the forces in truss chords that lock the bolt movement, by adding a structural truss replacement, with a symmetrical prestressing force to replace the compression chord, or symmetrical compressive force to replace the tension chord.
   g) Providing coating of bolts with paint or galvanic method.
   h) If it is possible, the working forces are removed (e.g. excessive overlay load, or even concrete slab) or temporairily detoured (e.g. traffic loads)
   i) Providing scaffolding and equipment to transport steel profiles.

2) Construction stage :
   a) Cleaning of existing structural surface
   b) Loosening of bolts by using appropriate wedges and pins

c) Inserting the new bolt simultaneously with the removal of the old one.

d) Attaching the additional profile on the existing structure

3) Maintenance stage

a) Providing routine bolt fastening

b) Providing periodical corrosion inspection in particular on interface surfaces.

c) Providing routine painting schedule

2.3.2 CFRP strip addition (*Carbon Fibre Reinforced Polymer*) / *steel plate bonding*

Purpose : Adding strength to resist axial forces and bending forces in the steel/concrete element section, by bonding an additional plate of steel or polymer plastic sheet

1) Pre stage :

a) Providing steel sheet or polymer plastic sheet and appropriate bonding material.

b) Providing scaffolding and equipment for transportation of steel profiles.

c) Providing bolts and other bonding materials.

d) Painting to protect the steel plates to be bonded against corrosion

2) Construction stage :

a) Surface cleaning

b) Steel members require shielding to avoid excessive heat that will influence the physical properties of the bonding agent.

c) Scaffolding to hold the plates during bonding process

d) Placing dowels/bolts and bonding layer

e) Placing steel plates/ CFRP

3) Maintenance stage :

a) Providing periodical corrosion inspection in particular on interfaces

b) Providing routine painting schedule

2.3.3 Strengthening of connections/splices

Purpose : To anticipate cracking tendency caused by overload and fatique phenomena (achievement of lower cracking stresses in steel than yield stress by cyclic repetition at certain level)

1) Pre stage : similar to strengthening by increasing cross section / replacement of weak elements
2) Construction stage : similar to strengthening by increasing cross section / replacement of weak elements
3) Maintenance stage : similar to strengthening by increasing cross section / replacement of weak elements

2.3.4 Placing additional elements such as additional truss chords

Purpose : Distributing chord forces of the existing structure to additional truss chords, reducing the buckling length

1) Pre stage :
    a) Detailed structural analysis in particular if the connection point with the new truss causes significant change in internal force distribution
    b) Measurement of the available clearance for placing the new truss chords. Thereby determining the profile types that can be placed.
    c) Measurement of the exact length of the additional truss.
    d) Providing additional equipment for loosening and placing back of the bolts.
    e) Providing bolts with greater length and steel grade that confirms to existing bolts.
    f) Protecting the new truss profiles with an anti-corrosive layer
    g) Providing scaffolding and equipment for transportation of steel profiles.
    h) Providing equipment to enlarge bolt holes if case bolts do not fit.
2) Construction stage :
    a) Reducing loads on the structure or removal of working loads
    b) Bolt loosening

c) Fixing and placing new steel profiles in such a way that the bolts can accurately be placed

d) Placing the bolts back and fastening

3) Maintenance stage:

a) Routine bolt fastening programme

b) Providing a protective coating layer as soon as some corrosion can be detected

2.3.5 External prestressing on steel truss bridges

Purpose : Prestressing tendons induce stress with a sign opposite to those in the original structure on the bridge, therefore the load carrying capacity and camber of the structure is improved.

1) Pre stage :

a) Alignment is determined by accurate design considering the dilatation gap at the abutment wall, clearance underneath the bridge, the chords that are crossed by the cable, and critical chords that will be reduced in stress, anchorage and deviator locations in connection with the prestressing force to be applied.

b) Providing ducts and prestressing tendons

c) Providing hydraulic pump that has been calibrated and is not leaking.

d) Providing scaffolding and equipment to transport the hydraulic pump

e) Design and construction of anchorage assemblies and deviator.

2) Construction stage :

a) Placing anchorage assemblies and deviators including boring new bolt holes.

b) Placing cable ducts and prestressing tendons

c) Reduction and removal of working loads during prestressing process

d) Repair of bearing system to hinge-roller function when stressing is applied, in achieving optimal compression results.

e) Reduction of floor stiffness that obstructs the force in providing additional camber, if possible but not recommended if the cross girder has shear connectors.

f) Stressing is applied gradually and simetrically between truss sides until the required stressing is achieved. An interval of 25% is applicable for the stressing process in stages.

g) Loosening bolts up to 50% of the minimum torsion value to optimize the effect on additional camber during removal of bridge slab.

h) Fastening bolts up to 100% minimum torsion value to increase stiffening of connections in the truss frame during cable stressing

i) Monitoring camber and section shape during stressing to control excessive stressing

j) Grout injection in cable sleeves.

3) Maintenance stage :

a) Monitoring of cables if sleeves are not filled wth cement grout, to observe fatique indication of the cables.

b) Monitoring the anchorage ends to make sure that grout filling is correctly carried out, to prevent ingress of corrosion on the cables

c) Monitoring steel elements that have been bored and bolt holes to prevent corrosion

d) Routine painting of new bolt holes or steel profiles that had to be bored for inserting/placing the cables, anchorages and deviators

e) Filling/sealing of empty gaps that have potency to induce corrosion at anchorage assemblies and deviators.

2.3.6 Strengthening by adding a supporting system on the steel truss bridges

Purpose : reducing of the bridge span by providing additional supporting or changing the internal force distribution through the changed structural system.

1) Pre stage :

a) Detailed structural analysis is required regarding the change of forces in the steel truss chords in particular the axial forces that change from

tension to compression or reversely. This change will also influence change of forces in the floor structure. The floor structure may be subjected to a change of moment forces that are not resisted by the existing reinforcement and finally causing cracking in the deck slab.

b) Determine the location of additional supporting in connection with placing a new pier

2) Construction stage :

a) Determine location of the supporting pier

b) Foundation for the new pier

c) Construction of the supporting system

d) Placement of bearings on the new support

3) Maintenance stage :

a) Monitoring the bearings on the new support

b) Monitoring cracking of the deck slab

c) Monitoring deformation of the steel truss

2.3.7 Replacement of deck structure by a lighter system on steel truss bridges

Purpose : Reducing the deck load leading to reduction of element forces in the steel truss and thereby improving the deck performance to a higher load capacity .

1) Pre stage :

a) Design of the new deck structure, including the connections at the cross girders

b) Equipment to remove the concrete deck slab

c) Equipment to transport the crushed deck slab parts

d) Measurement of the distance between segments of the steel truss after concrete deck removal, to enable the placement of the new plate as accurate as possible

2) Construction stage :

1. Removal of the existing asphalt layer and concrete deck
2. Placing of wing assembly for supporting the new plate
3. Boring new bolt holes for the supporting assembly of the new plate

4. Fastening bolts to 100 % minimum torsion value
5. Constructing new shear connectors
6. Transporting the new plate
7. Placing the new plate into position on the steel truss
8. Casting the connection at cross girders

3) Maintenance stage :

a) Monitoring cable stressing for precast concrete deck slab system
b) Monitoring transverse cracks at cross girders for precast concrete deck slab system
c) Monitoring transverse cracks at bottom side of precast concrete deck slab system

or

d) Monitoring cracks of the orthotropic steel deck plate
e) Monitoring corrosion of the orthotropic steel deck plate
f) Monitoring debonding/spalling of the asphalt layer on the steel deck plate

2.4 Application of bridge strengthening methods

2.4.1 Strengthening by enlarging of concrete sections

Strengthening by enlarging the section of concrete beams and adding reinforcement is commonly used. This method can be used at the top or bottom sides of the concrete elements. The main task is to perform sufficient bonding of new to old concrete. The difference in shrinkage of the two concrete types may cause lack of bond. This is overcome by using shear connectors and/or non-shrink concrete.

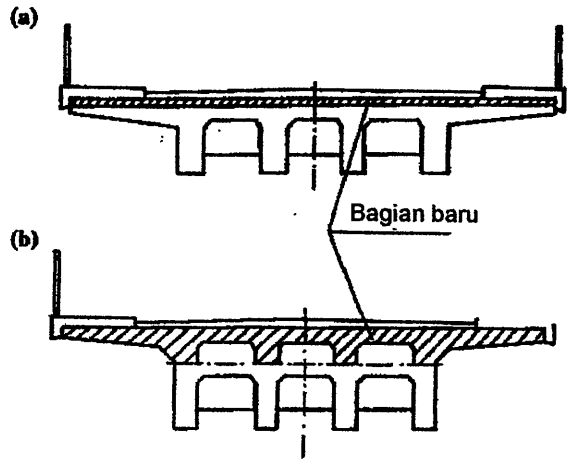
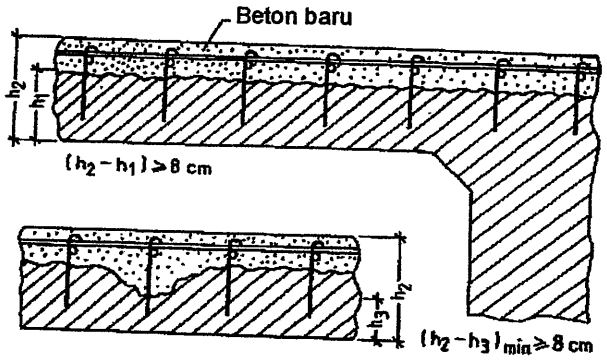
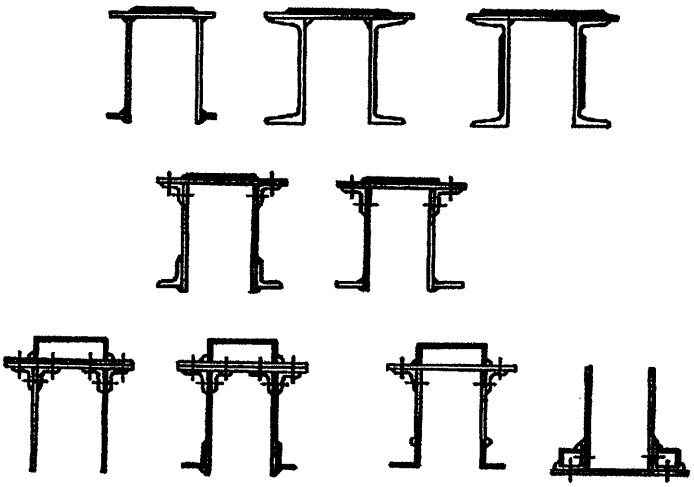


Figure 2.3 Strengthening by enlarging slab and beam sections

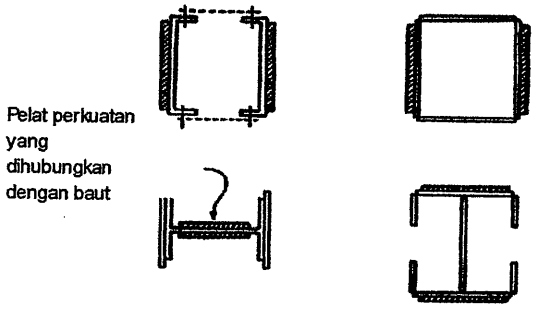


Gambar 2.4 Stengthening by enlarging deck slab section

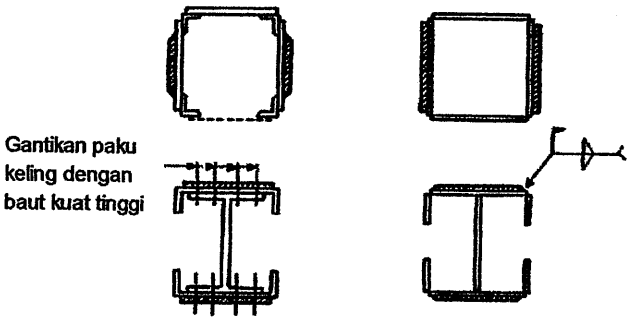
The strengthening by enlarging sections can also be applied to steel bridges (Figure 2.5)



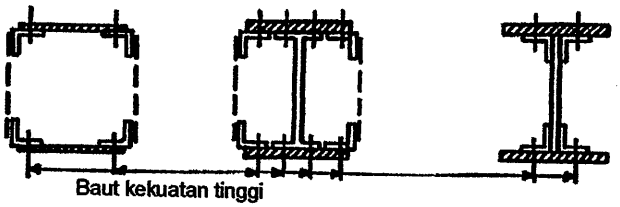
(a)


Pelat perkuatan
yang
dihubungkan
dengan baut

(b)

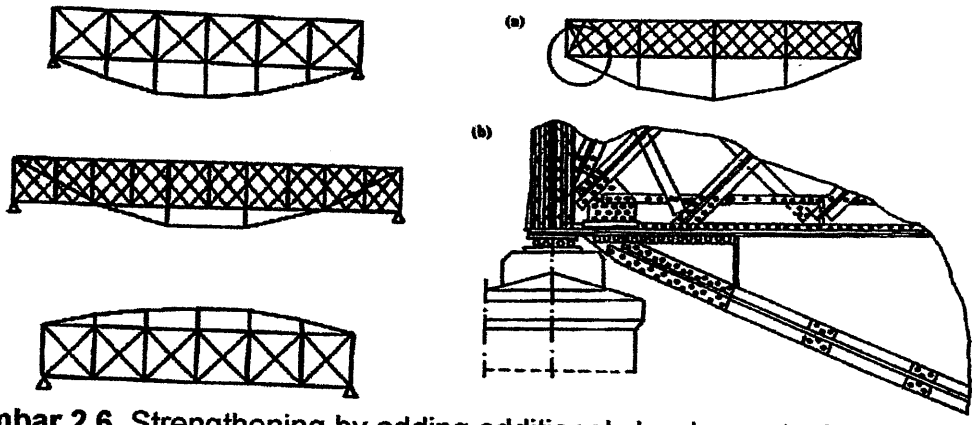

Gantikan paku
keling dengan
baut kuat tinggi

(c)



(d)

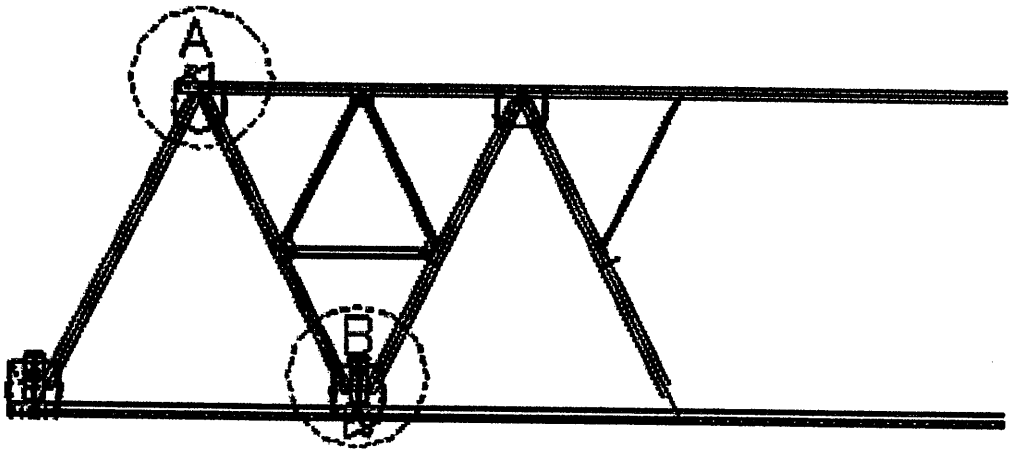
Figure 2.5 Strengthening by enlarging the section using additional steel plates on steel trusses (a) additional plates/profiles (b) additional plates for tension chords (c) additional plates for compression chords (d) additional plates for vertical chords



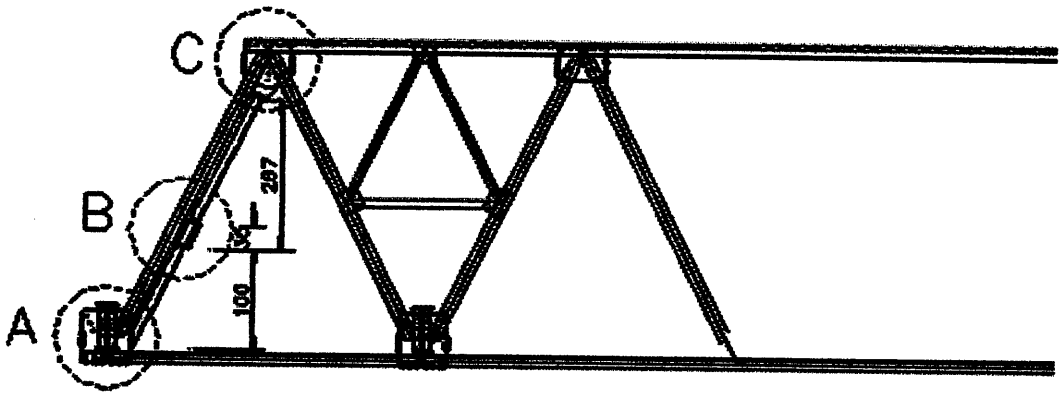
Gambar 2.6 Strengthening by adding additional chords on steel truss bridges

2.4.2 Replacing weak elements

The replacement of tension or compression chords is initialized by a method to carry out chord removal in a safe way. This method needs care and traffic on the bridge has to be reduced or stopped during the removal process. Replacing of tension chords need a temporair prestressed bar to counteract tension, and a temporair jack to counteract compression (Figure 2.7). Another method is by using a temporair frame besides the existing truss.



(a)



(b)

Gambar 2.7 Replacing of tension chord and compression chord (A) placing external prestressed bar in replacing tension chord (B) placing jack supported by additional frame in replacing compression chord

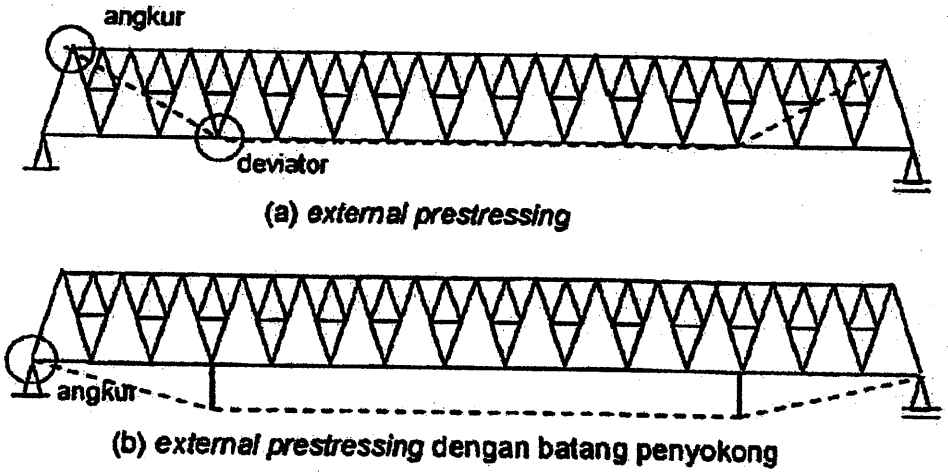
2.4.3 External prestressing

This strengthening method is most universal because it can be applied to different structural types. Besides for concrete structures it can be applied to steel structures. The main elements for this strengthening method are prestressing cables, anchorages and deviators.

Strengthening by external prestressing simplifies the application of axial loads that are combined with uplift loads leading to increase bending and shear capacity of the structure. Capacity and serviceability of the bridge will also increase. As an example, the stiffness increase by external prestressing can reduce defection and

vibration in service life of the bridge. Critical locations can be reduced in stress to improve performance against fatique besides reducing the existing deflection..

The principals of external prestressing are similar to prestressed concrete bridging, that is the application of a compressive force combined with the moment eccentricity that increase the bending capacity and controls the cracking of a concrete girder.



(a) *external prestressing*

(b) *external prestressing* dengan batang penyokong

Gambar 2.8 External prestressing on steel truss bridges

The anchorage system is similar to the one used in prestressed concrete. Nowadays producers provide special anchorages for external prestressing including facilities for corrosion protection and replacing of strands in future maintenance work. Anchorages in steel trusses can be placed at upper or lower sides of the truss. Tendons can be straight or trapesoidal according to design requirement. The advantages of external prestyressing are as follows :

a) Restriction of traffic is not required
b) Construction is quite simple
c) Inspection of externally placed cables and anchorages is quite simple
d) Cables can be re-tensioned periodically.
e) Cables can be replaced if necessary in future

Some disadvantages are as follows :

a) Detailed analysis is required to ensure that no overstressing occurs in the deck, girder and truss chords. This may result is strengthening of some chords in truss bridges due to external prestressing influence.
b) Externally placed cables are vulnerable to vandalism and corrosion
c) During external prestressing procedures some movement occurs in vertical and horizontal directions, causing secondary stresses in deck slab and truss chords.
d) In steel trusses, the axial force application can disturb the local stability , and therefore local strengthening of anchorage assemblies or additional profiles/plates are required at anchorage locations

2.4.4 Steel Plate Bonding

Strengthening by using steel plate bonding is similar to adding reinforcement (steel plate) that is compositely bonded to the concrete by using epoxy resins. Steel plate bonding strengthening improves bending and shear capacities.

A disadvantage of this method is that temperatures higher than 60° C will reduce the epoxy resin strength and thereby reduce the bonding of steel plates to existing concrete.

The shear strength of epoxy resin is minimal similar to high strength concrete 8 MPa and the shear strength of existing concrete should be minimal 4 MPa. This is in practice very difficult to obtain, as existing concrete structures have frequently a lower quality.

The epoxy resin must have a bending modulus strength of 2 - 8 GPa and to ensure durability (30 years service life) the temperature of the structure have to be between -20°C to +40°C.

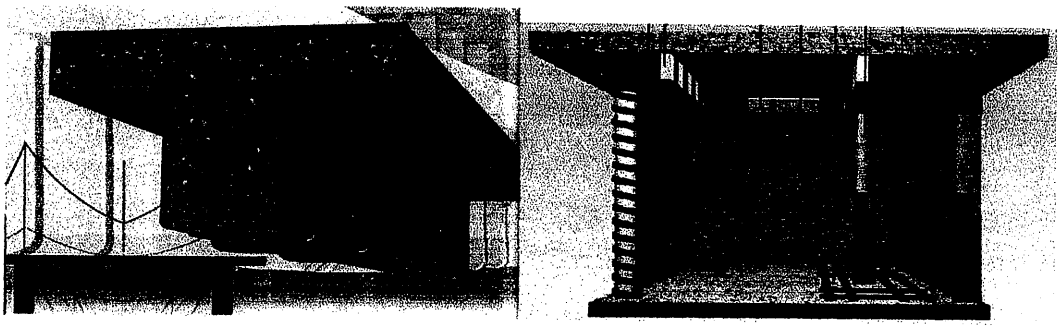
The design procedure for this strengthening method is by the assumption that the steel plate is compositely integrated to the concrete, using elastic and plastic limit state calculations.

2.4.5 Carbon Fiber Reinforced Polymer sheets (CFRP)

This method use *Carbon Fiber Reinforced Polymer* (CFRP) and is similar to the steel plate bonding method. The CFRP carbon fibre sheet is compositely bonded

to the concrete by using epoxy resins. CFRP strengthening increase bending and shear capacities.

The advantage of CFRP is the high strength and light weight, enabling simple construction compared to the steel plate bonding.



Gambar 2.9 Strengthening by using CFRP

Tabel 2.4 Comparison between Steel Plate Bonding and CFRP sheet

Steel plate bonding		CFRP sheet	
Advantages			
1.	Economical	1.	Corrosion is no problem
2.	Commonly used	2.	Light weight
3.	Sufficient strength and fatigue resistant	3.	High strength and fatigue resistant
4.	Forces in any direction	4.	Simple construction and maintenance
5.	Can use dowels/anchors if necessary	5.	No splicings
Disadvantage			
1.	Sensitive to corrosion	1.	Costs relative high
2.	Relative heavy	2.	Not commonly used
3.	Construction relatively difficult	3.	Forces only in one direction.
4.	Need splicings		
5.	Higher scaffolding costs		

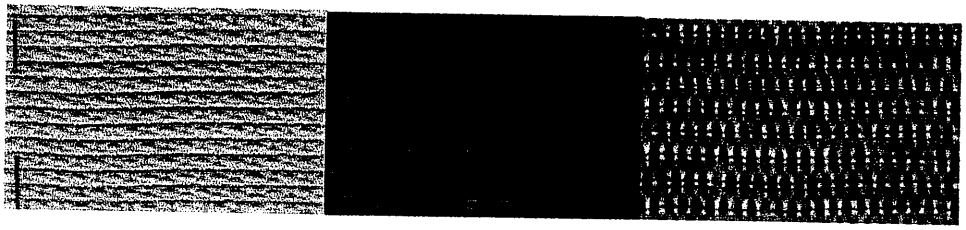
Strengthening by CFRP on reinforced concrete structures considers the following :

1. Bending strength of the section to be strengthened
2. Allowable shear strength
3. Capacity of the epoxy connection
4. Bonding strength or dowelling
5. Safety factor of the concrete without strengthening

The design procedure of strengthening using CFRP sheet is different from conventional concrete design. The performance of CFRP sheet at time of carrying load is linear-elastic and has no plastic deformation. The maximum bending strength of the section is when the CFRP sheet fails together with the yield of reinforcing steel, before compression failure in concrete occurs.

2.4.6 Fiber Reinforced Polymer (FRP)

Strengthening of concrete structures by using Fiber Reinforced Polymer (FRP) is a new method. FRP is a material using fibers of carbon, aramid and glass with epoxy resin bonding. This method is very flexible and can be used for strengthening several structural shapes.

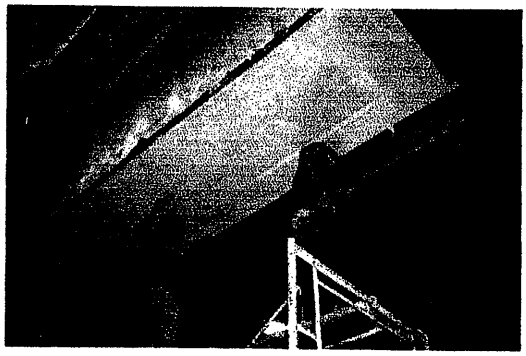


(a) (b) (c)

Gambar 2.10 Fibers for strengthening material (a) carbon (b) aramid (c) glass

The design procedure for strengthening using FRP is so far not standardized, therefore designers use assumptions based on laboratory testing results. Technical data for calculations depends on the information from producers. The construction of this strengthening method is as follows :

1. Placing an epoxy resin layer on the existing concrete surface and also on the fiber surface to be bonded
2. Bonding the fiber material to the concrete surface
3. Fiber is again painted with epoxy resin by using roller
4. After initial setting of the epoxy, a protective layer is placed against UV influence and environment



(a)

(b)

(c)

Gambar 2.11 Strengthening by using FRP on U type concrete box girder a) placing of fiber (b) painting of fiber with epoxy (c) sealing by anti-UV layer

2.4.7 Changing structural system

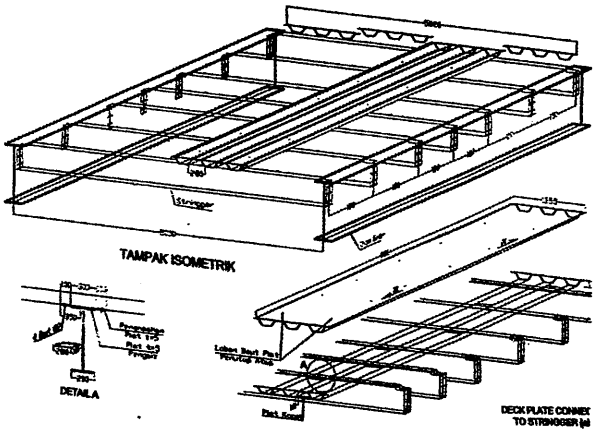
This method changes the structural system without strengthening of components, some examples are as follows :

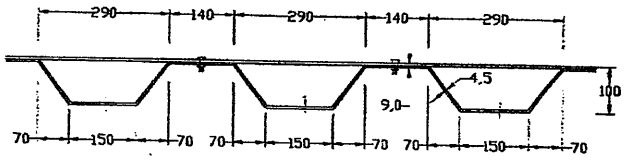
1. Changing the system of minimal 2 simple spans to a continuous span. In this method the deck slab is made continuous for carrying live loads only. The dead loads are carried by each span acting as a simple beam.on two supports.
2. Changing the structural system by adding a new system such as cable stayed , arch or truss

2.4.8 Deck slab modification

The deck slab can be modified by using several methods for replacing the existing deck as follows :

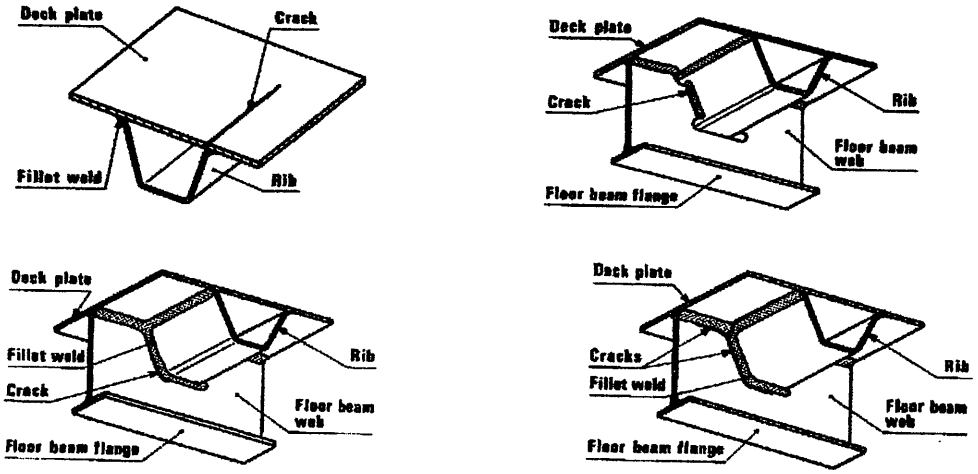
1. Replacing the concrete deck with orthotropic steel deck. The connection strength of the deck plate with the cross girder has to be calculated against fatigue cracking, as the steel truss bridge moves dynamically at connection points or lower gusset plates. Therby the bond of the asphalt layer to the orthotropic deck has to be improved by using epoxy coat bonding.





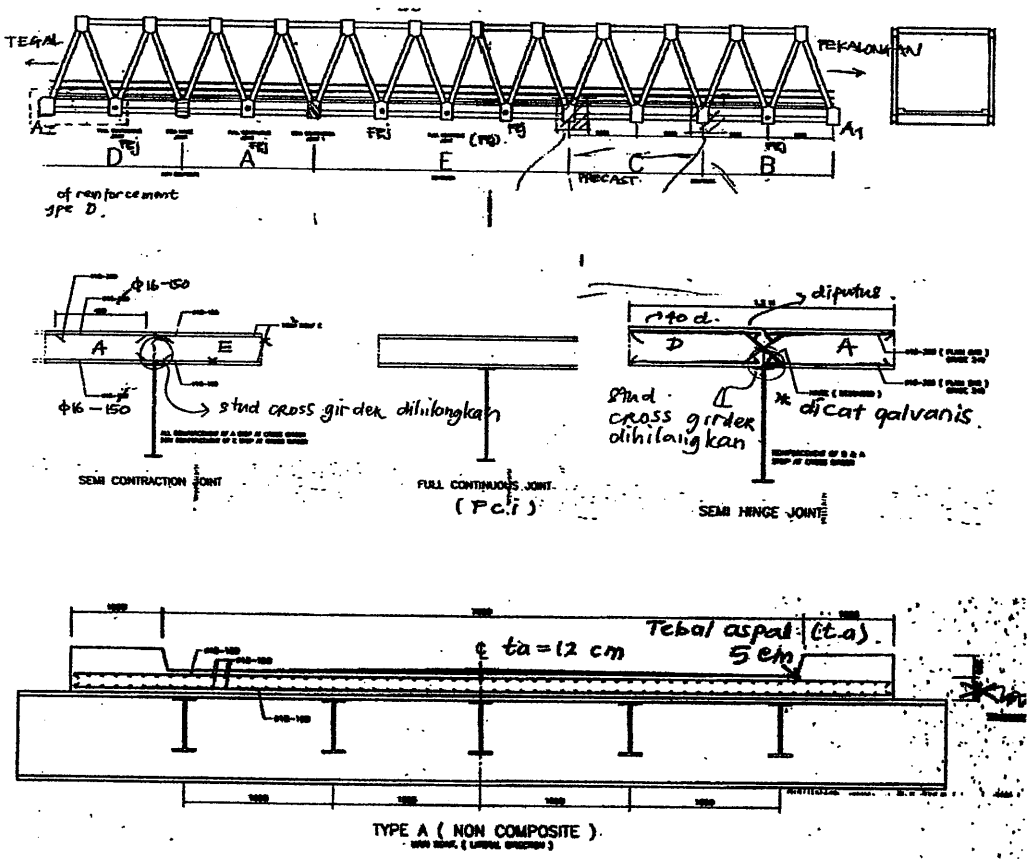
DECK PLATE MODEL 2

Gambar 2.12 Construction of orthotropic steel plate deck



Gambar 2.13 Cracking in connections between cross girder and orthotropic steel plate

2. Additional reinforcement by considering the actions on the bridge deck that have not been calculated in the previous design, including localizing measures for cracking formations.



Gambar 2.14 An example of a full scale experiment to compare several types of concrete deck systems separated by construction joints at 10m interval

3. Reinforced concrete deck replacement can be carried out by using precast concrete slab elements or corrugated steel plate system that is compositely connected with shear connectors into the concrete slab. These alternatives have been included in the full scale experiment (Figure 2.14)

III. CASE STUDY OF KEDANG PAHU BRIDGE

3.1 Background

Sei Kedang Pahu Bridge is located in a mine area belonging to PT. Trubaindo Coal Mining (TCM), West Kutai Regency, East Kalimantan Province. Bridge construction phase was already finished on April 2005 although there were additional works still to be done for instance: finishing work on bridge curb on 12 m extended span and additional bridge embankment until first loading test in the same month. Some of the design and construction revision has also been done to fit the condition by PT. TCM Advisor teams.

There is crack occurrence over the bridge slab which is indicated in first loading test in 2005. To forecast the effect of that crack in bridge performances, the specific bridge load test & condition monitoring is carried out.

3.2 Changing in Bridge Condition

Bridge condition before the first loading test visually seemed a good condition. No structural crack has been found before loading test started. But the camber was not formed good enough, thats why the sidewalk and railing seem not straight enough at certain section, see Figure 3-1 and 3-2.

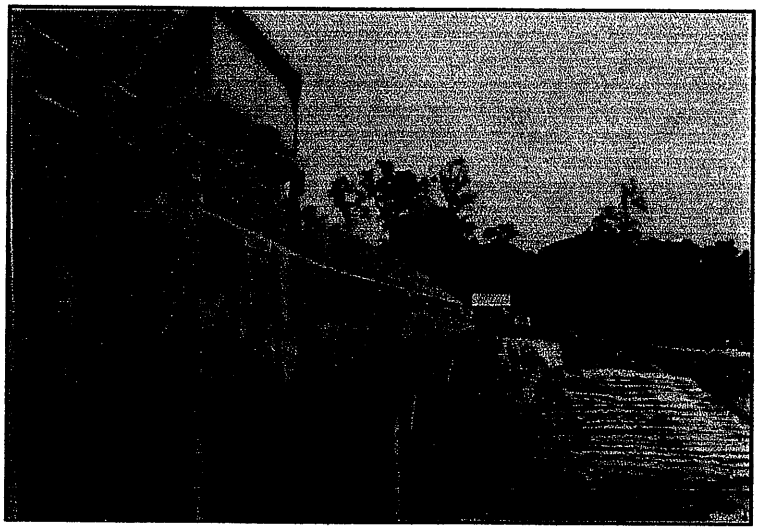


Figure 3-1 Uneven bridge soffit in first loading test

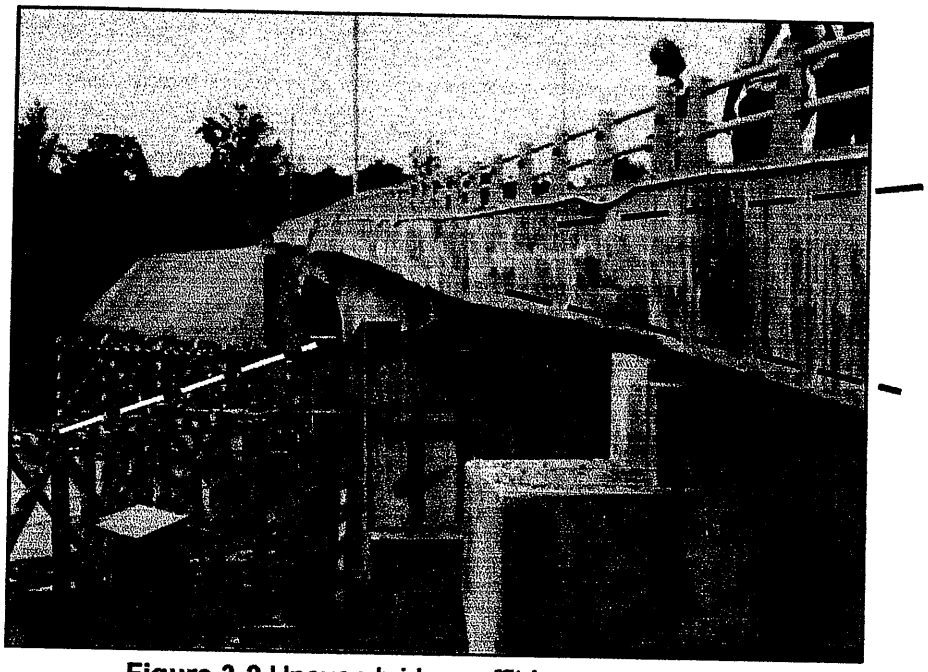


Figure 3-2 Uneven bridge soffit in second loading test

Bridge expantion joint is equipped with two angle covering plates after first loading test above the concrete slab which has been designed as in the as-built-drawing, see Figure 3-3 for condition in first loading test and Figure 3-4 for condition in second loading test.

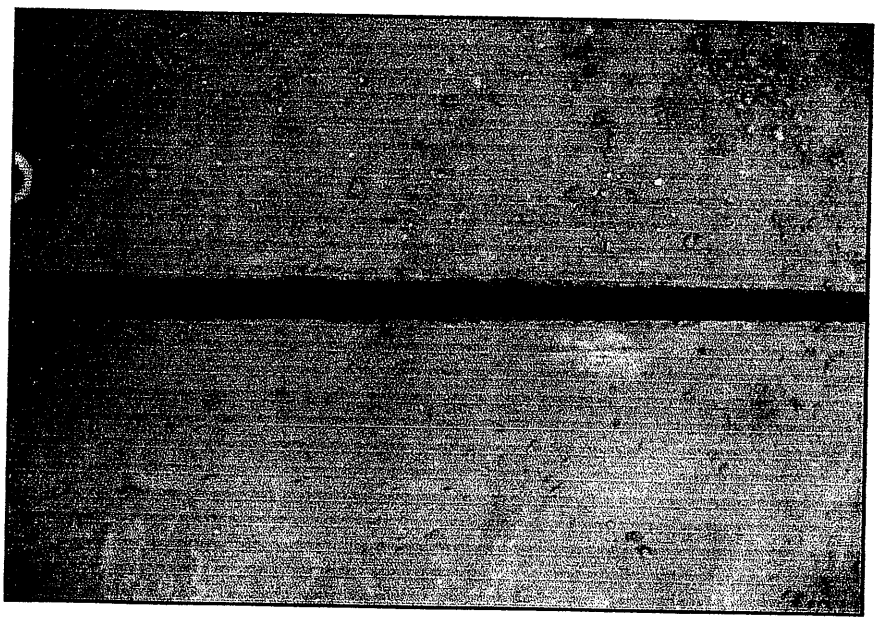


Figure 3-3 Double angle expansion joint without covering plate in fist loading test

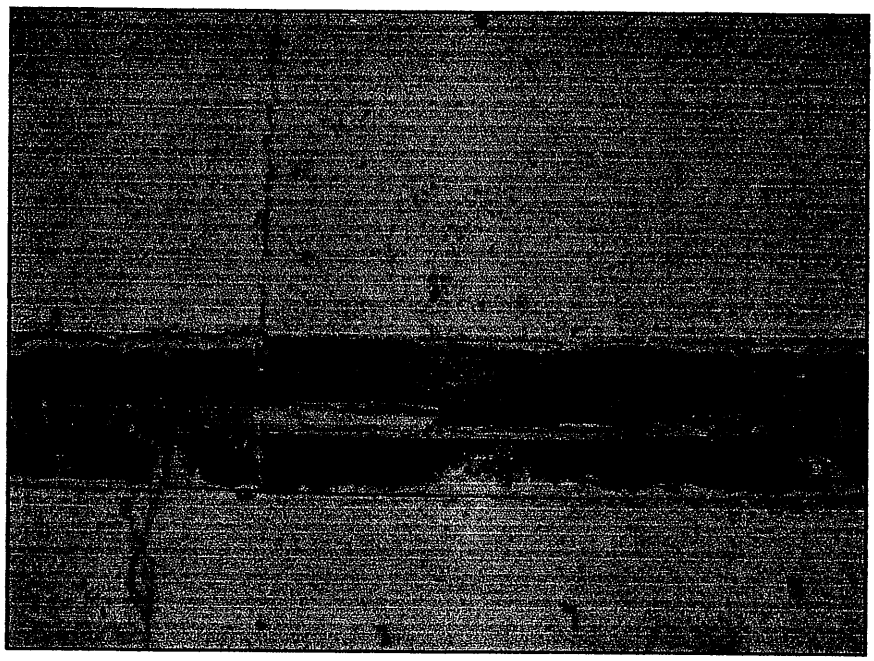


Figure 3-4 Double angle covering plate with broken rubber filler in second loading test

To stabilize bridge lateral movement, the owner constructed driven pile bracing between driven steel piles on the pier section. Also pier protection/ bridge fender construction work has been done properly so no wood or timber hooks onto the bridge driven piles. To protect against corrosion, which occurred in first loading test, coating protection with paint has been implemented onto piles, see Figure 3-5 and Figure 3-6 for condition in first loading test and Figure 3-7 for recent condition.

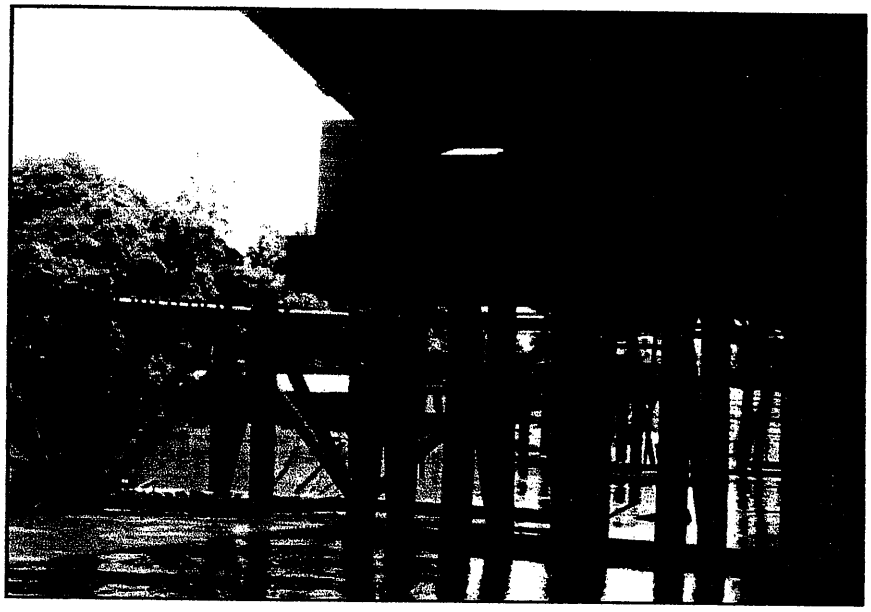


Figure 3-5 Driven pile bracing below pier section and bridge fender system in first loading test

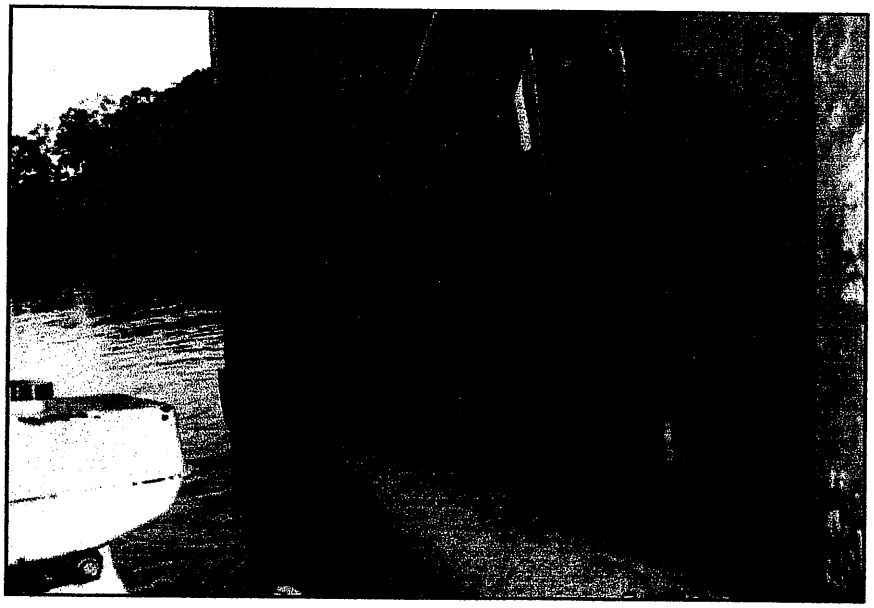


Figure 3-6 Corrosion on steel driven pile in first loading test

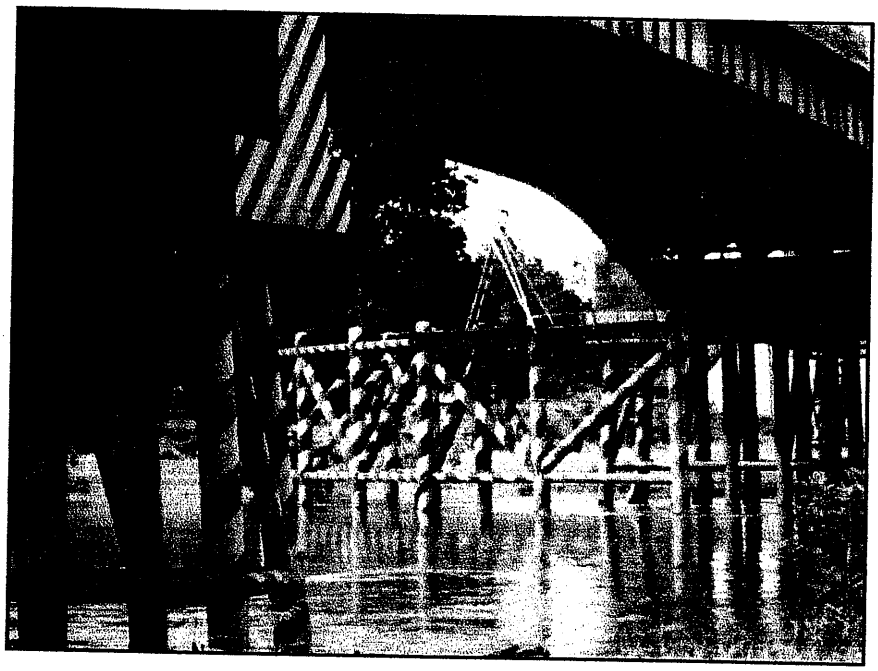


Figure 3-7 Paint coating for corrosion protection on bridge pile and fender

Although it seems that corrosion still occurs in joints between pile and pier footing and lower part of corrugated steel plate near bridge deck sewer pipe, see Figure 3-8 and Figure 3-9.

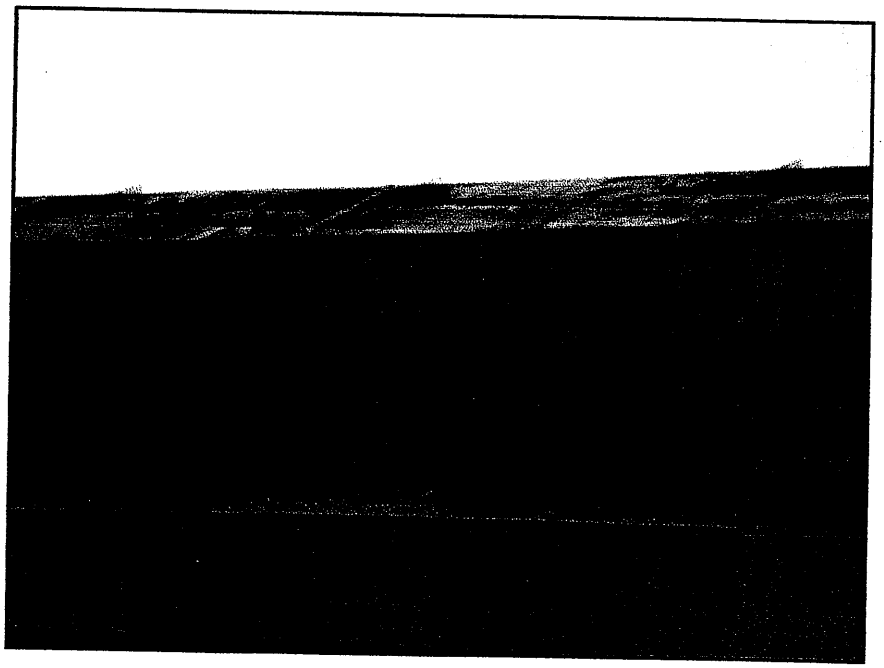


Figure 3-8 Corrosion in lower part of bridge deck

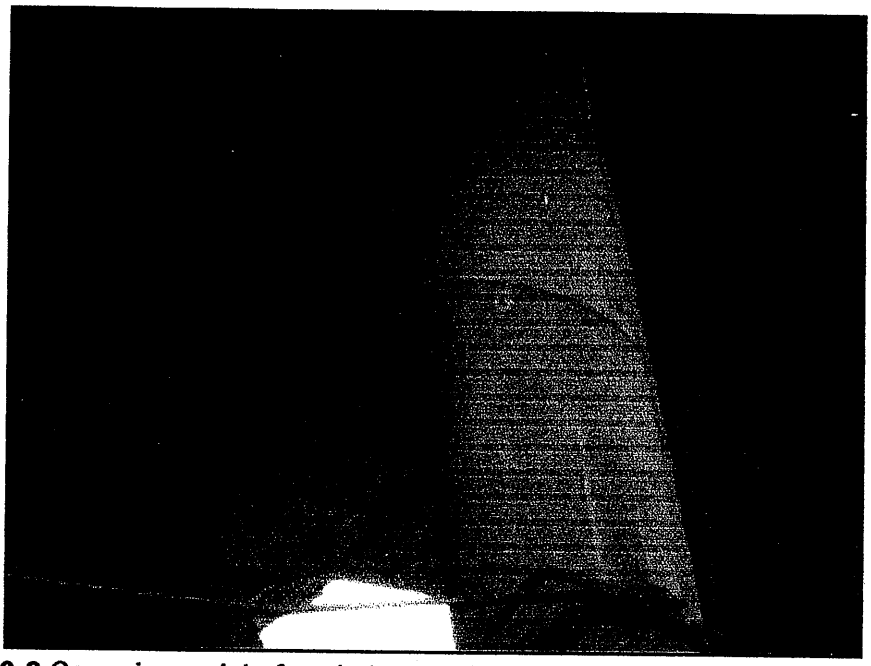


Figure 3-9 Corrosion on interface between pier footing and the tip of pile foundation

At the soffit of second pier from Adong side, a large gap under the corrugated steel plate surface has been found and is still not repaired yet, see Figure 3-10 and Figure 3-11.

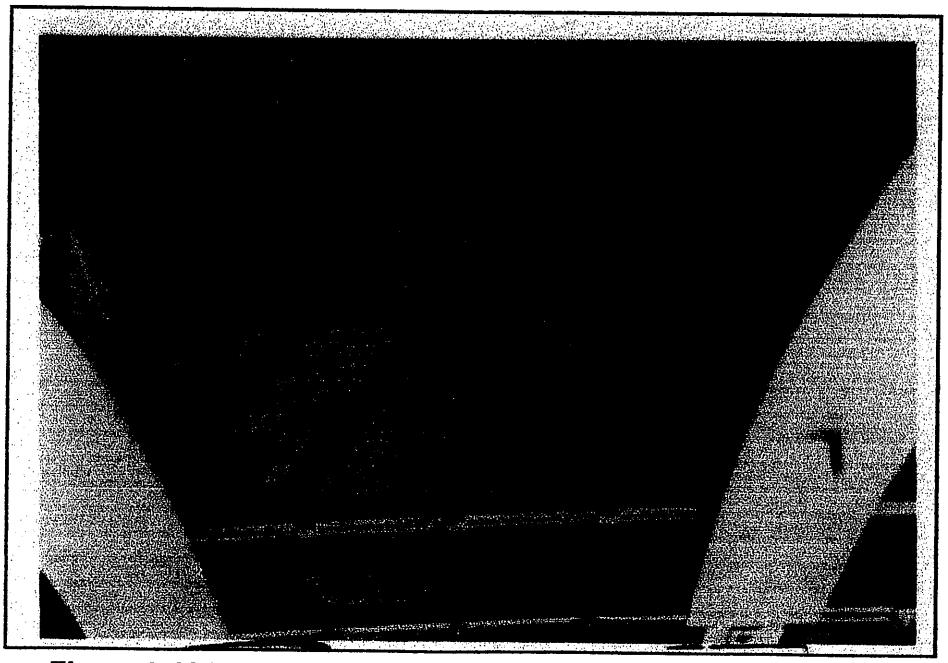


Figure 3-10 Large gap on the corrugated steel plate in first loading

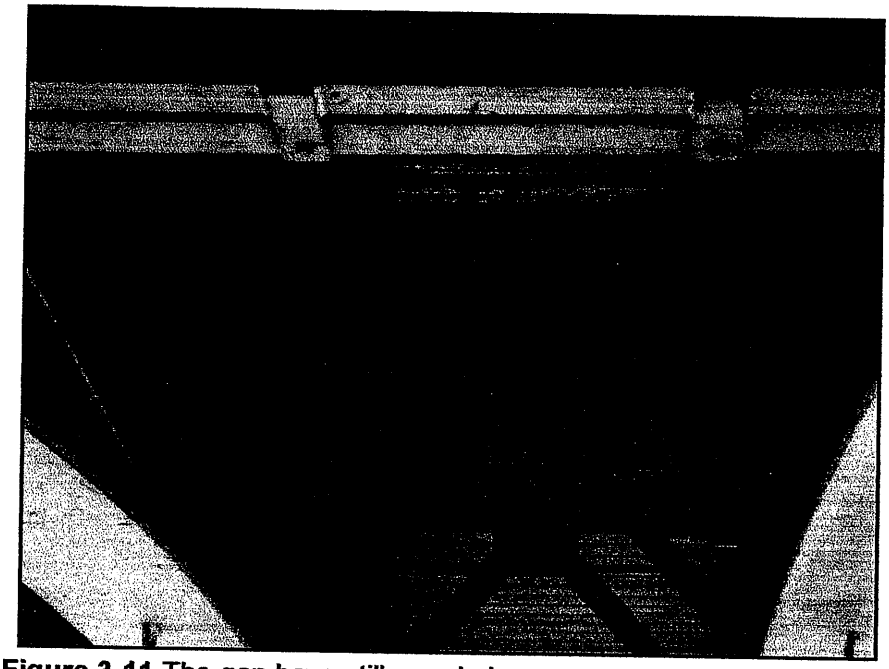


Figure 3-11 The gap have still remain in same position after two years

Uncompleted bolt component has been installed and also tightened, see Figure 3-12.

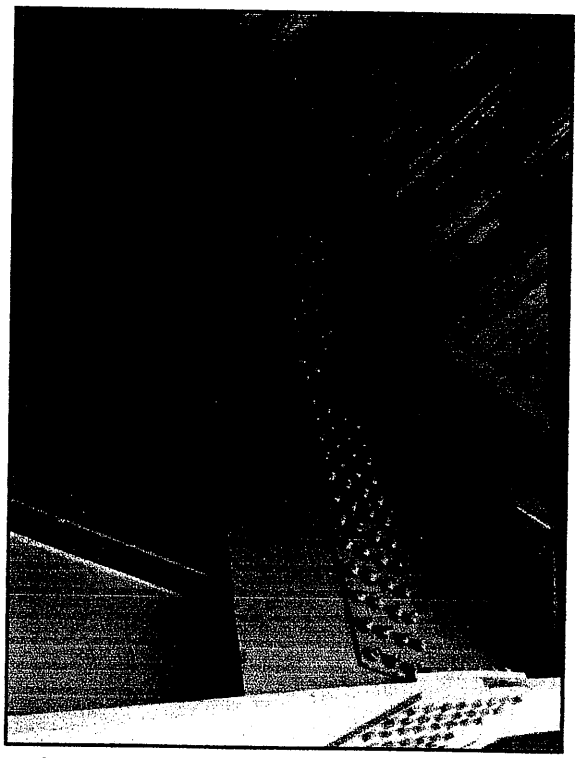


Figure 3-12 All bolts have been tightened and marked

Bridge bearing pad and lateral stopper also work properly without outranged deformation.

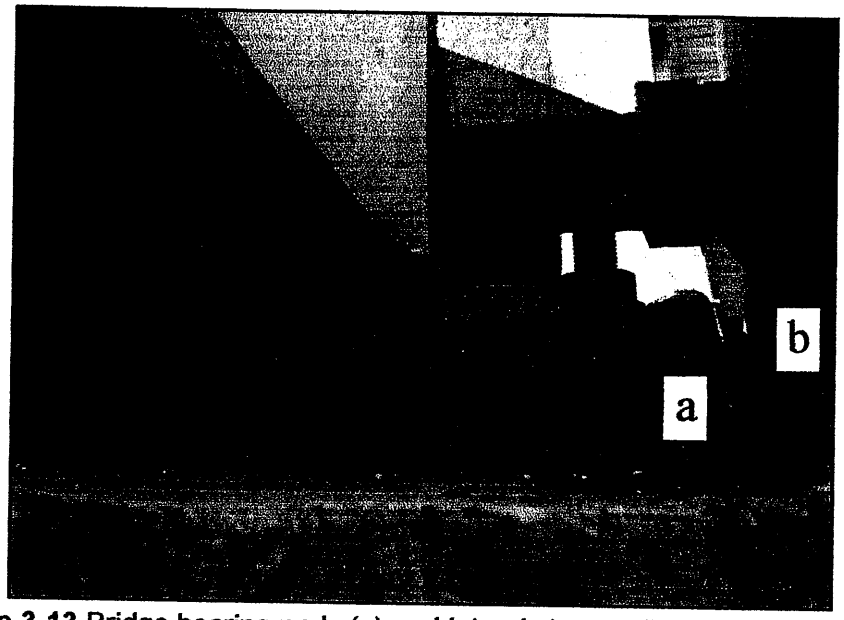


Figure 3-13 Bridge bearing pads (a) and lateral stopper (b) in recent condition

The embankment slope stabilization has also been improved by laying geotextile, which has been done in first loading test, reinforced with combination of stone masonry and concrete filler, see Figure 3-14 for condition in first condition and Figure 3-15 for recent condition.

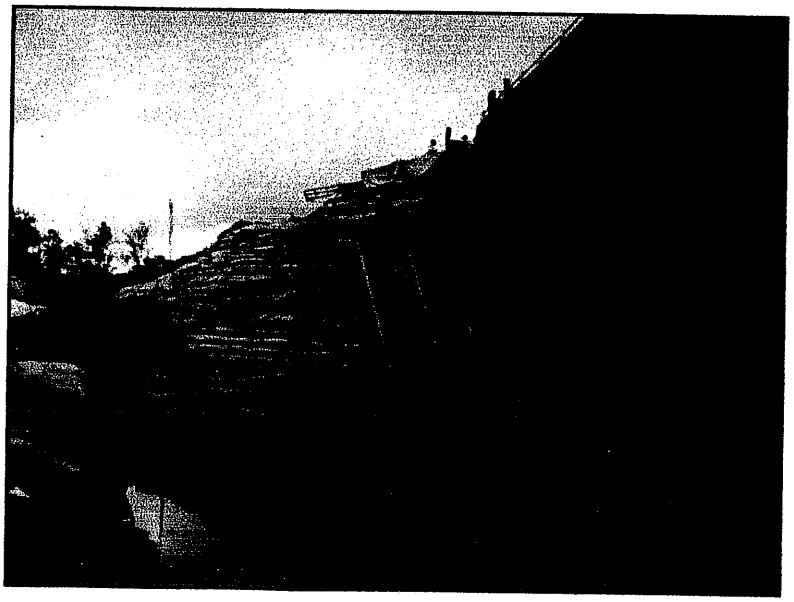


Figure 3-14 Slope protection with geotextile in first loading test

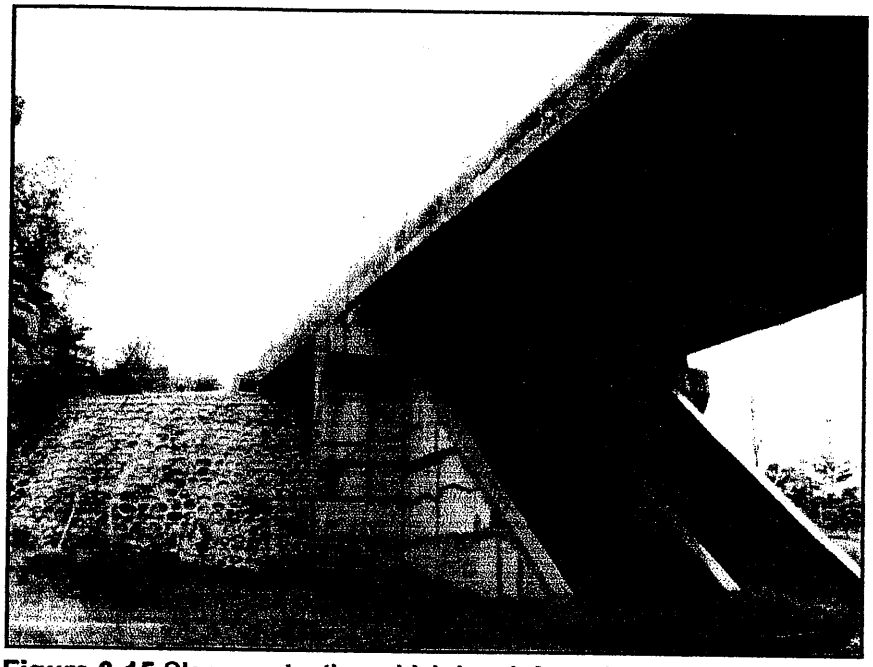


Figure 3-15 Slope protection which is reinforced with stone masonry

IV. CONCLUSIONS AND RECOMMENDATIONS

1. Bridge inspection and repair techniques are becoming special engineering fields
2. Some repair methods can only prolong the service years until a new bridge can be bulit
3. Durable repair is still the main target of bridge strengthening
4. More investigation and study on fatigue of concrete structures has to be carried out
5. Early deterioration of concrete structures is mainly caused by insufficient concrete quality

V. REFERENCES

1. Radomski Wojciech, 2002, *Bridge Rehabilitation*, Imperial College Press, London, UK

2. IRE, 2008, *Final Report Kedang Pahu Bridge Load Testing and Condition Monitoring*

3. IRE, 2010,*Workshop and Training Course onHighways Development and Technology*

Technical Session III
TRAFFIC AND TECHNOLOGY

Local ITS Strategy

- Grass-Roots ITS in Kochi -

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Research Center for Advanced Information Technology,

National Institute for Land and Infrastructure Management (NILIM)

1

Local ITS in Japan

- Solutions for local traffic problems
- Local specification
- In general, simple and easy functions using mainly road units
- Niche Market

2

What's Grass-Roots ITS ?

- Local ITS proposed and developed by Kochi University of Technology (KUT) & Kochi prefecture
- Cooperative movement by Public, Private, Academia and Local people (PPA&L)
- Deployed by Grass-Roots movement

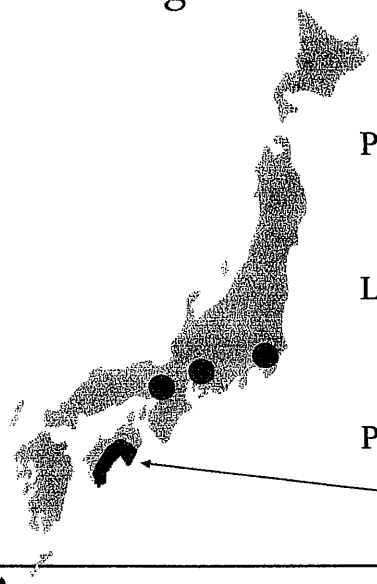
3

Three Features of Grass-Roots ITS

- Needs are from the fields
- Products are by local companies
- Maintenances are with local residences

4

Three Mega Areas and Many Micro Towns



Population rate

$$\frac{\text{Three Metropolitan Areas}}{\text{Whole Country}} = 0.49$$

Land rate

$$\frac{\text{Three Metropolitan Areas}}{\text{Whole Country}} = 0.10$$

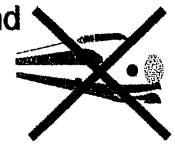
Population desnsity(/Km^2)

$$\frac{\text{Kochi Prefecture}}{\text{Average of Whole Nation}} = \frac{115}{336}$$

5

Local disparities in Kochi !

1. Aging society & Depopulation
   - Elderly rate 24.1% (ranked 3rd)
   - Population growth rate -0.15% (ranked 38th)
   - Death rate (10.3 /1000) (ranked 1st)
2. Undeveloped social infrastructure
   - Poor public transportation such as trains and buses
   - Road reform rate 41.6% (ranked 44th)



3. Severe natural disaster
   - 83.3% covered by mountains and forest area (ranked 1st)
   - Frequent typhoon and heavy rainfall

6

Then, what's happing in Kochi !

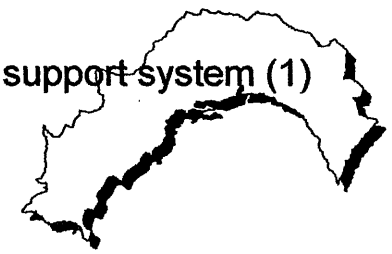
- High rate of aged persons' fatal accidents
- Uncomfortable road traffic circumstances
- Frequent unexpected road damage by disaster

Therefore, Grass Roots ITS !

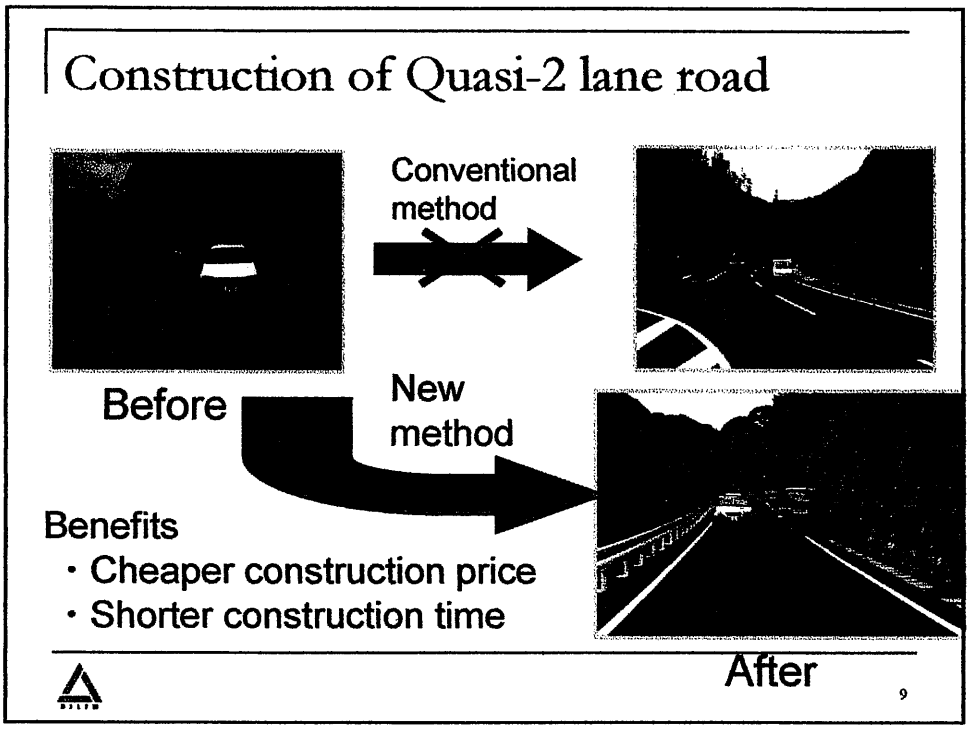
7

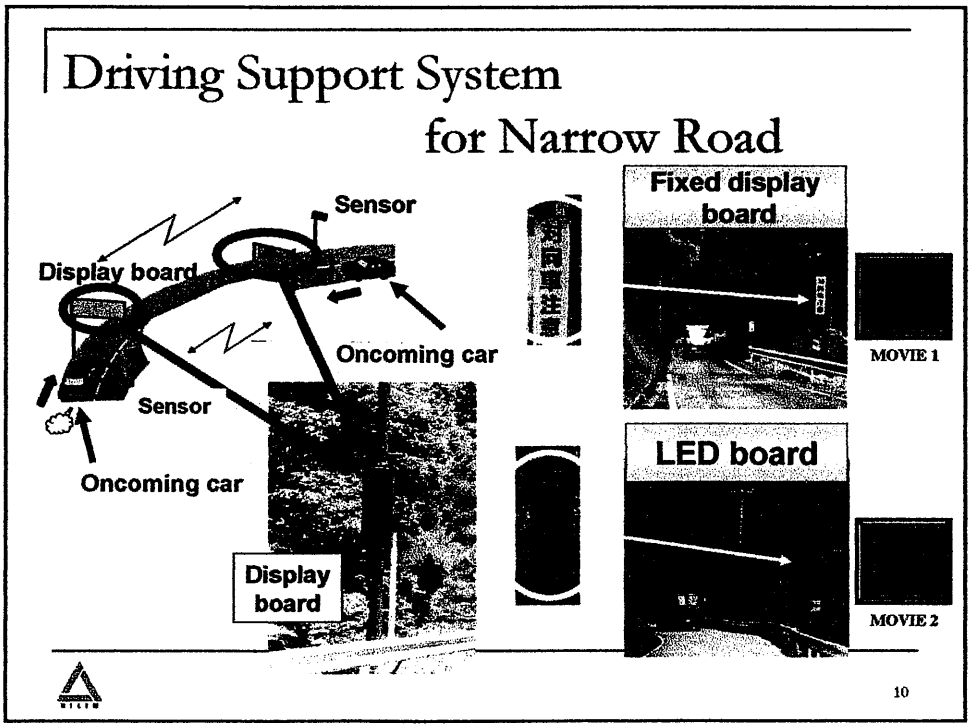
Deployed Systems in Kochi

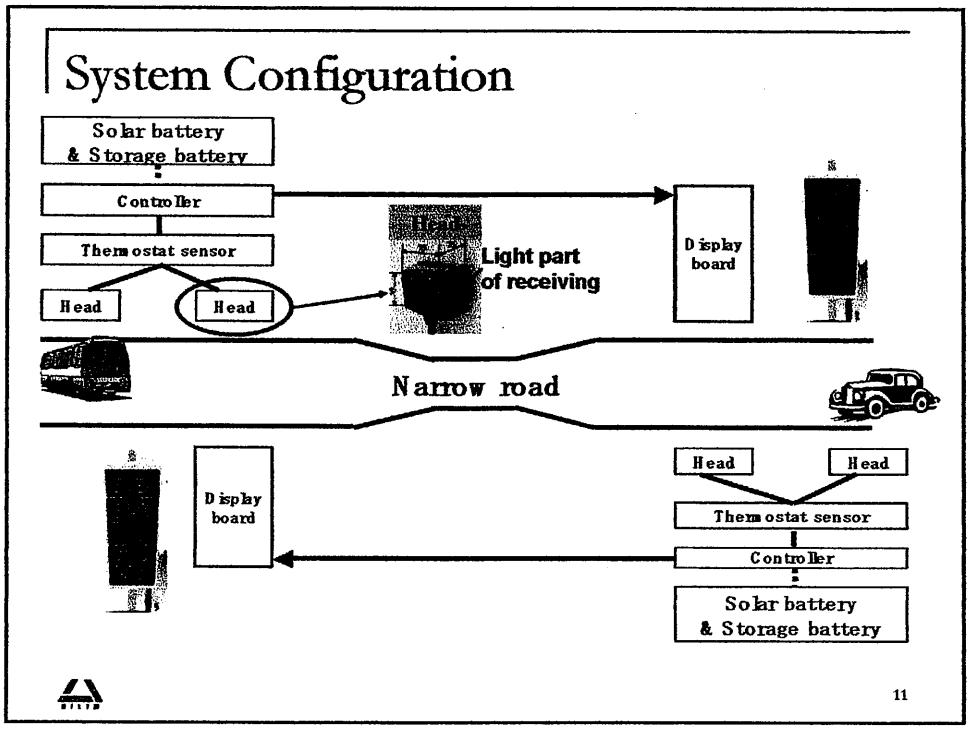
- Driving Support Systems for Narrow Road (44)
- Safety Support System at "Stops without No safety barriers" (7)
- Pedestrian Safety Support System (1)
- Simplified VMS (23)
- Tunnel pedestrian safety support system (1)

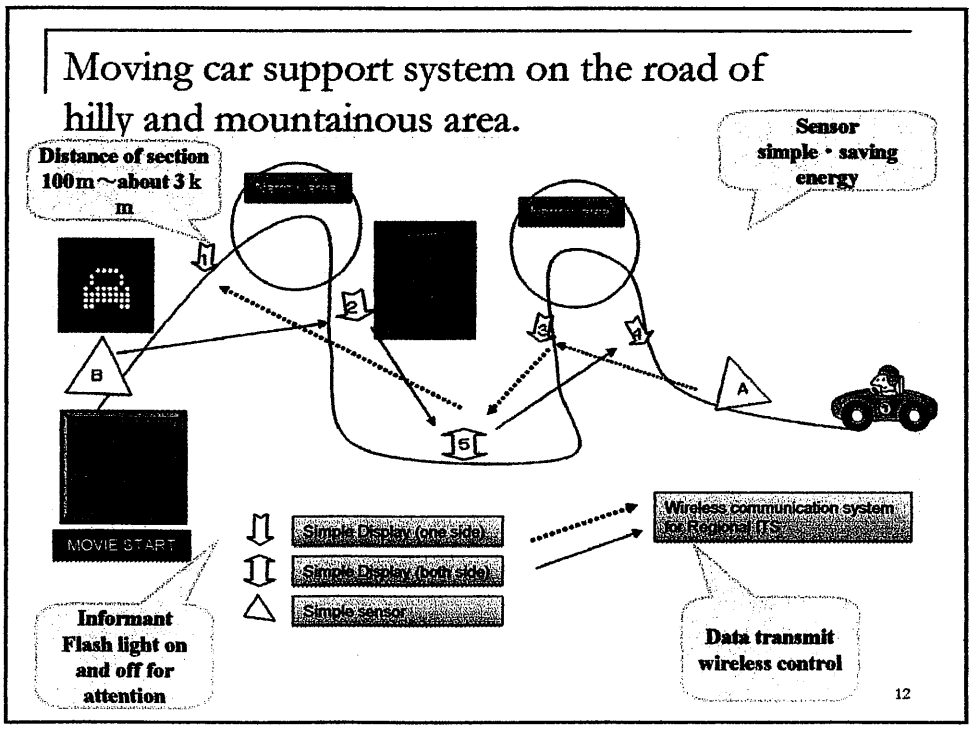


8

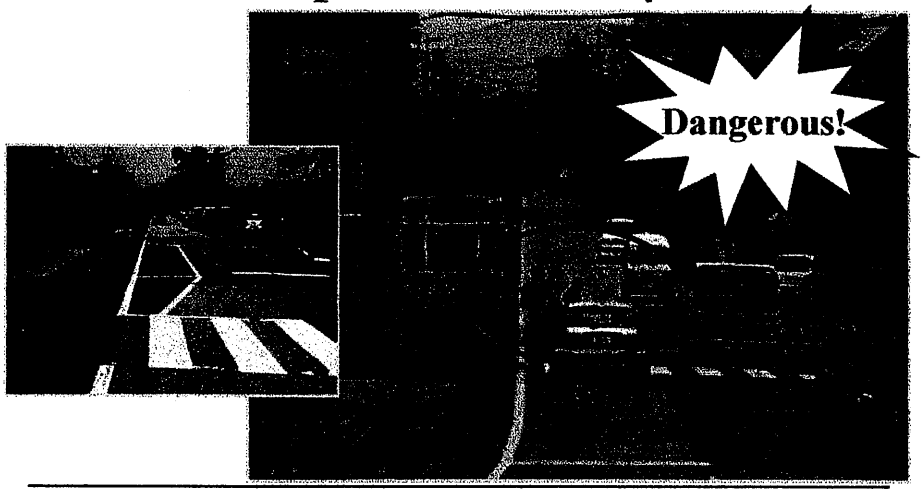

Construction of Quasi-2 lane road
Conventional method
Before
New method
Benefits
・Cheaper construction price
・Shorter construction time
After
9


Driving Support System for Narrow Road
Sensor
Display board
Oncoming car
Sensor
Oncoming car
Display board
Fixed display board
MOVIE 1
LED board
MOVIE 2
10


System Configuration
Solar battery & Storage battery
Controller
Thermostat sensor
Head
Head
Head
Light part of receiving
Display board
Narrow road
Display board
Head
Head
Thermostat sensor
Controller
Solar battery & Storage battery
11

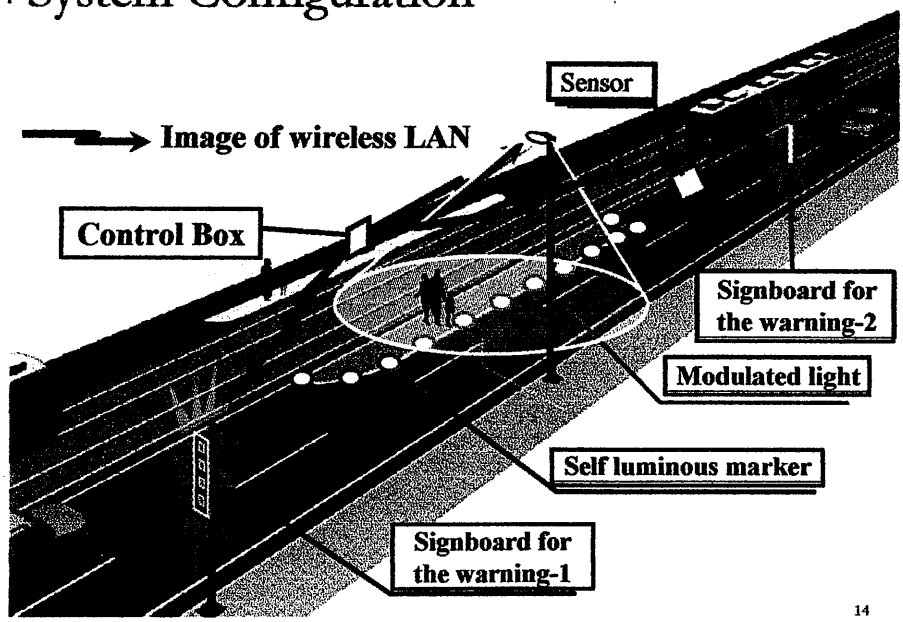

Moving car support system on the road of hilly and mountainous area.
Distance of section 100m~about 3km
Sensor simple・saving energy
1
2
3
4
5
A
B
MOVIE START
Simple Display (one side)
Simple Display (both side)
Simple sensor
Wireless communication system to Regional ITS
Informant Flash light on and off for attention
Data transmit wireless control
12

Safety Support System at "Stops without Safety Barriers"



13

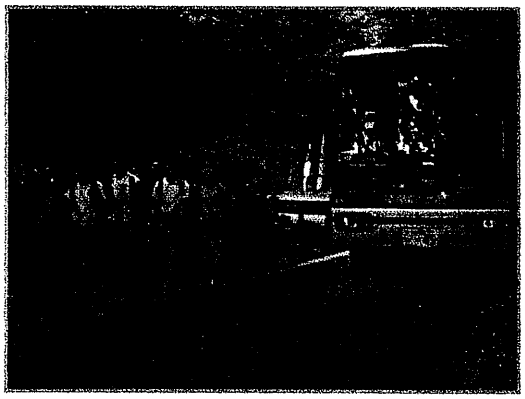
System Configuration



14

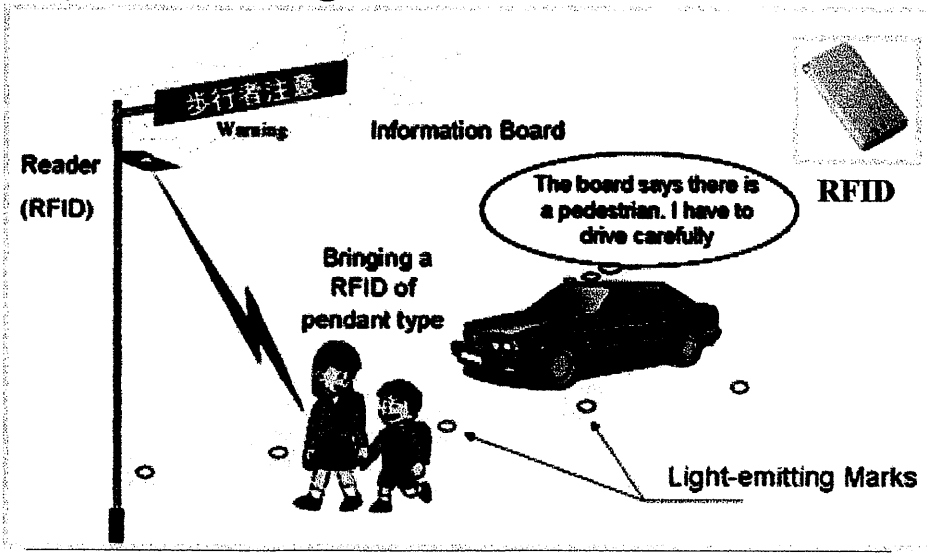
Pedestrians Safety Support System in the Rural Area

Development of the Pedestrian Information System to Improve the Safety in the Intermediate and Mountainous Area



15

System Configuration



16

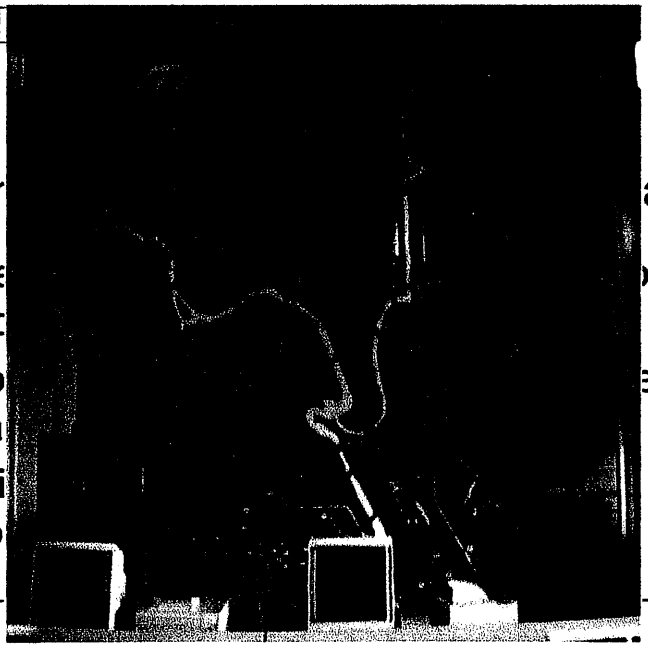
Characteristics of Grass-Roots ITS

Those systems introduced have the common characteristics as follows

- Second best method
  - ✓It is not the best method and the best method is hard to realize due to high cost and long term construction.
- Cheap cost
  - ✓Operating cost is very important
- Not Seeds but Needs oriented
  - ✓Needs need Seeds

17

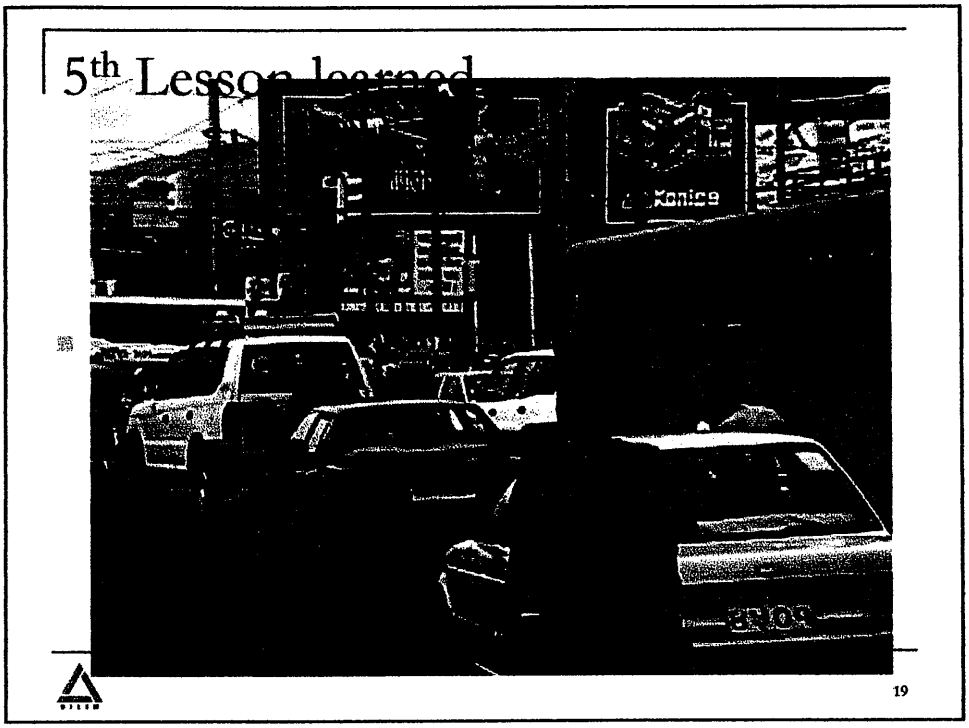
4th I

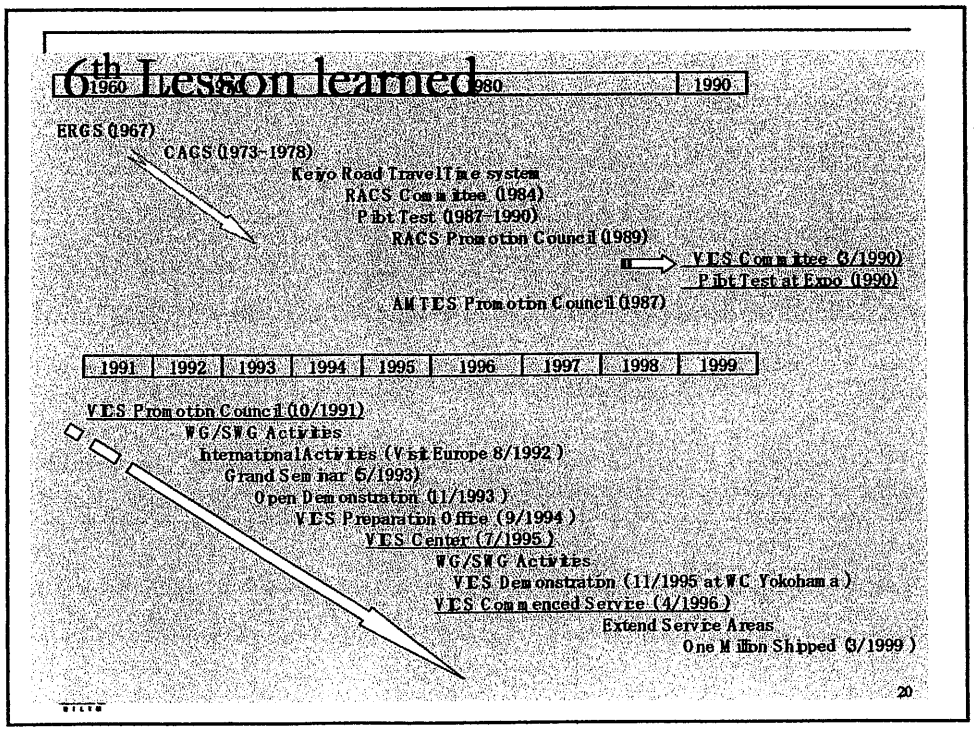


ir are

- Fie the loc
- Fo ent by na
- Wi dose no

18


5th Lesson learned
Konica
19


6th Lesson learned
1960
1980
1990
ERGS (1967)
CACS (1973-1978)
Keyo Road Travel Time system
RACS Committee (1984)
Pilot Test (1987-1990)
RACS Promotion Council (1989)
VES Committee (1990)
Pilot Test at Expo (1990)
AMTES Promotion Council (1987)
1991
1992
1993
1994
1995
1996
1997
1998
1999
VES Promotion Council (10/1991)
WG/SWG Activities
International Activities (Visit Europe 8/1992)
Grand Seminar (6/1993)
Open Demonstration (1/1993)
VES Preparation Office (9/1994)
VES Center (7/1995)
WG/SWG Activities
VES Demonstration (11/1995 at WC Yokohama)
VES Commenced Service (4/1996)
Extend Service Areas
One Million Shipped (3/1999)
20

7th Lesson learned

Grass-Roots ITS may work effectively
not only in Kochi,
but also in many Asian countries

21

Summary

- ITS is classified into two types, the Nation wide ITS and the Local ITS
- Grass-Roots ITS is the local ITS proposed and developed by Kochi
- Several Grass-Roots ITS are already deployed and work effectively
- Grass-Roots ITS is sometimes not the best but the second best method, but useful for local cities like Kochi

22

Summary (continued)

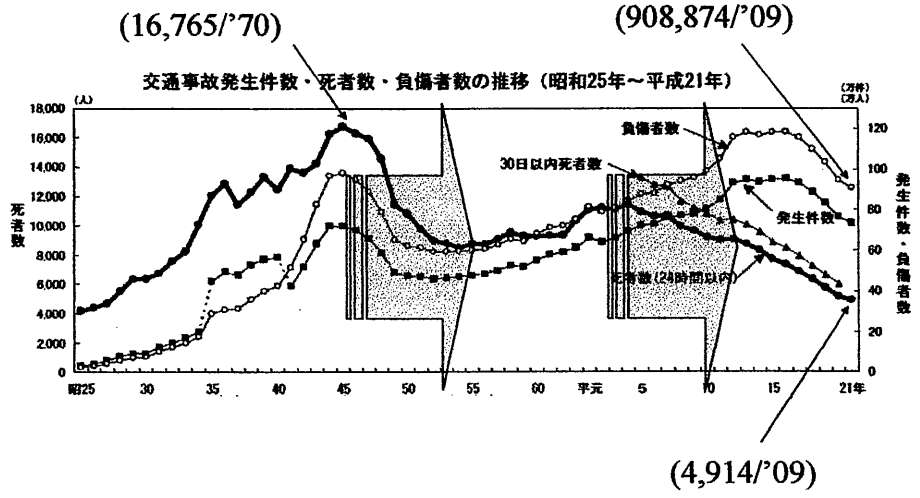
- Many Asian countries have traffic problems caused by rapid economic growth and delayed infrastructure deployment
- ITS is expected as the tool for improving those traffic problems
- Especially, Grass-Roots ITS is thought as the tool for traffic solution in Asian countries

23

Thank you for your attention

24

Traffic accidents in Japan



From the Home Page of the National Police Agency

25

STRATEGY ON ITS DEVELOPMENT IN INDONESIA

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Research and Development Center for Roads and Bridges,
Ministry of Public Works Indonesia

2010

ABSTRACT

In generally road traffic is growing rapidly in Indonesia, weather in urban or interurban road. In major city such as Jakarta, in 2008 it has 6.3 million vehicles with a growth of 11% per annum. This is the same as 700 private vehicles addition every day which require 3 km more of road length per day, while the road growth is currently only 0.1% (Sinaga, Elly 2008). Such conditions will lead to decline the average speed of vehicles that would cause high operating costs of vehicles, value of time loss, and also psychic losses.

Engineers have many ways to reduce the impact of traffic congestion, one of which is to make components of transportation can communicate with each other. Technologies that integrate the transportation component is ITS. ITS technology has evolved over the last 2 decades, and Indonesia began to implement ITS during 1990's with the application of ATCS (Area Traffic Control System) in Bandung.

This paper will cover state of the art of ITS in Indonesia and set forth the ideas about Indonesian strategies for developing ITS. It may contains prioritization of ITS program, role sharing among parties as well as a possible form of cooperation between stakeholders in running ITS

Keyword: Indonesian ITS, Technology, Road Transport

1. Introduction

1.1 Present Status in Indonesia

In 2008, Jakarta has 6.3 million vehicles with a growth of 11% per annum. This is the same as 700 private vehicles addition every day which require 3 km more of road length per day, while the road growth is currently only 0.1% (Sinaga, Elly 2008). Such conditions will lead to decline the average speed of vehicles that would cause high operating costs of vehicles, value of time loss, and also psychic losses.

Total number of loss due to traffic congestion in major cities in Indonesia is estimated at 25.2 trillion rupiah per year. (Widiantono)

Today Indonesian are confronted by a number of changes in social conditions, such as :

1. Over 23,000 traffic accidents per year
2. Traffic congestion
3. Overloading
4. Bad road conditions
5. High cost commercial vehicle operations
6. Growing concern about environment
7. Rapid spread of mobile telephones and broadband Internet

Engineers have many ways to reduce the impact of traffic congestion, one of which is to make components of transportation can communicate with each other. Technologies that integrate the transportation component is ITS

1.2 Basic Philosophy of ITS

Intelligent Transport Systems is an umbrella term for a number of electronic, information processing, communication, and control technologies that may be combined and applied to the transport domain. There is no clear definition of what is ITS and what isn't. However, intuitively any ITS must show at least some form of information processing, computing, or vehicular or road network control to be considered intelligent. ITS may refer to a single technology, an integrated system, or a network of systems. As noted by Mitretek (1999), ITS is not a monolithic system, nor the integration of systems.

Rather "ITS is a multi-faceted approach for addressing transportation needs"

ERTICO (1997, cited in Rumar, et al., 1999) reported a vision for the future of ITS in which the following predictions were made:

- ITS will significantly contribute to a 50% in road fatalities.
- 25% reductions in travel times due to ITS.
- 50% reductions in city centers due to traffic management systems
- Automatic Crash Notification will result in a 15% reduction in fatalities.
- 40 hours per road user saved due to automated tolling systems.
- 50% delay reductions due to public transport priority systems.
- 25% reductions in commercial vehicle operations cost due to fleet management systems.

1.3 State of The Art of ITS in Indonesia

- In 1997, in Bandung, West Java, Indonesia has begun a new technology breakthrough by installing ATCS (Area Traffic Control Systems) for 60 intersections, cooperated with AWA (Australia). (www.beritajakarta.com)
- 2005, PT. Jasa Marga implemented smart card for Padaleunyi toll roads
- 2006, RDCRB built a prototype of smart card paying systems for toll Gate (touch and go systems)
- 2006, RDCRB developed ATC (Automatic Traffic Counter) and installed 4 units on the links of the national highway in West Java
- 2006, RDCRB developed "Sisjatan" (Roads and Bridges Information Systems) which contains any information about pavement, bridges conditions, traffic volume, etc on national highway in Indonesia.
- 2007, in Solo, Central Java, Indonesia, installed ATCS for 15 intersections (www.tempointeraktif.com)
- 2008, RDCRB developed "Wireless portable traffic signal" for road works
- 2009, e-toll (electronic payment for toll roads) implemented on Jakarta's intercity toll roads (www.jasamarga.com)

2. Strategy on ITS Development in Indonesia

2.1 Ultimate Goal

Safer, smoother, continuous, integrated and environmentally friendly Indonesian Transportation System

2.2 Targets

a. More effective and efficient use of infrastructure;
b. Enhance the flow of traffic;
c. Better public transport services;
d. Improve safety;
e. Cheaper freight costs; and
f. Reducing the impact on the environment.

2.3 Role Sharing

Role of private-sector operators

Capitalization of ITS on vehicle technology assets and support systems for pedestrian navigation

Role of RDCRB

Research and development on ITS technology

Provide actual data on road traffic

Publish the cost benefits associated with a policy based on traffic estimates.

Role of Ministry of Transportation

Issues regulations on traffic management system

Role of Automotive Manufacturer

Provide "on vehicles instrument" to support ITS technology

Role of Ministry of Public Work

Adjustment of the smart cities concept with local needs

2.4 Prioritization of ITS in RDCRB

Medium term of Indonesian ITS development are:

a. Optimization of Automatic Traffic Counter and axle load detector that have been installed in sections of national roads, and integrate them.
b. Updating *Sisjatan* as part of Traffic Monitoring Systems
c. Establish TMC (Traffic Monitoring Center) for public interest.

3. Discussion

RDCRB is an Institute under the government ministries responsible for road infrastructure. Together with the Directorate General of Bina Marga doing activities such regulate, coached, develop, and supervise of road infrastructure, which covers:

1. The inventory level of service roads and problems.
2. Formulation of plans and its programs implementation as well as determining the level of service for desired roads.
3. Planning, development, and optimizing the utilization of road space.
4. Improving the link roads geometric and or road intersections.
5. Test the feasibility of roads function in accordance with safety standards and traffic safety.
6. Development of information and communication systems of road infrastructure.

Research and Development Center of Roads and Bridges, in accordance with its duties and functions, has conducted several activities related to information and communication about the road infrastructure such as:

1. Develop the road information system (Sisjatan), which explains about the conditions inside the road infrastructure, road paving, such as data, geotechnical, bridges, and traffic.
2. Develop equipment to measure the elements of roads and bridges condition, and traffic.

Such activities above, prepared as data and road infrastructure conditions for input data of ITS

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Ministry of Public Work of Indonesia
Research and Development Center for Roads and Bridges
Traffic Engineering and Environment Experimental Station

Joint Workshop on Road and Bridge
RDCRB, NILIM Japan, and PWRI Japan
Bandung, March 2, 2010

Presented By : Pantja Dharma Oetojo, M.Eng. Sc

STRATEGY ON ITS DEVELOPMENT IN INDONESIA

INTRODUCTION

- In 2008, Jakarta has 6.3 million vehicles with a growth of 11% per annum
- 700 private vehicles addition every day which require 3 km more of road length per day, while the road growth is currently only 0.1%
- Total number of loss due to traffic congestion in major cities in Indonesia is estimated at 25.2 trillion rupiah per year

INTRODUCTION

- Over 23,000 road traffic accidents per year
- Traffic congestion
- Overloading
- Bad road conditions
- High cost commercial vehicle operations
- Growing concern about environment
- Rapid spread of mobile telephones and broadband Internet

BASIC PHILOSOPHY OF ITS

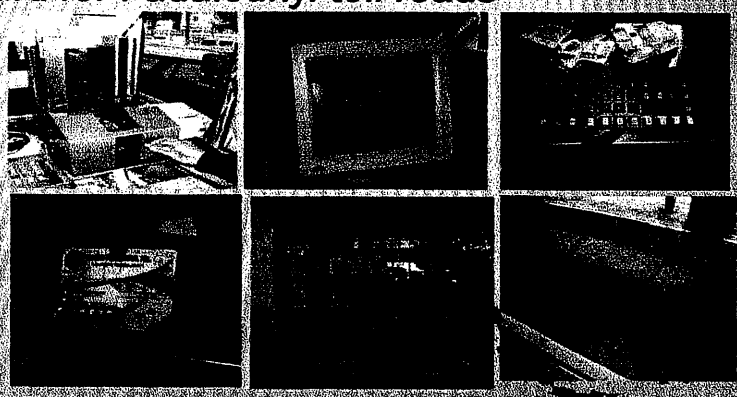
- Intelligent Transport Systems is an umbrella term for a number of electronic, information processing, communication, and control technologies that may be combined and applied to the transport domain
- ITS must show at least some form of information processing, computing, or vehicular or road network control to be considered intelligent
- ITS is not a monolithic system, nor the integration of systems

STATE OF THE ART OF ITS IN INDONESIA

- In 1997, in Bandung, West Java, Indonesia has begun a new technology breakthrough by installing ATCS (Area Traffic Control Systems) for 60 intersections, cooperated with AWA (Australia)

STATE OF THE ART OF ITS IN INDONESIA

- 2005, PT. Jasa Marga implemented smart card for Padaleunyi toll roads

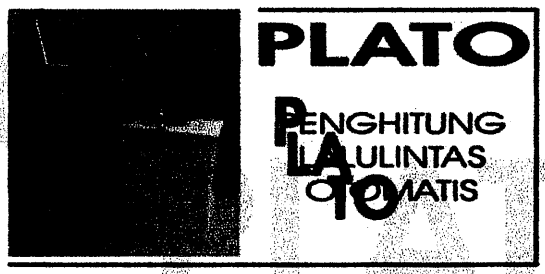


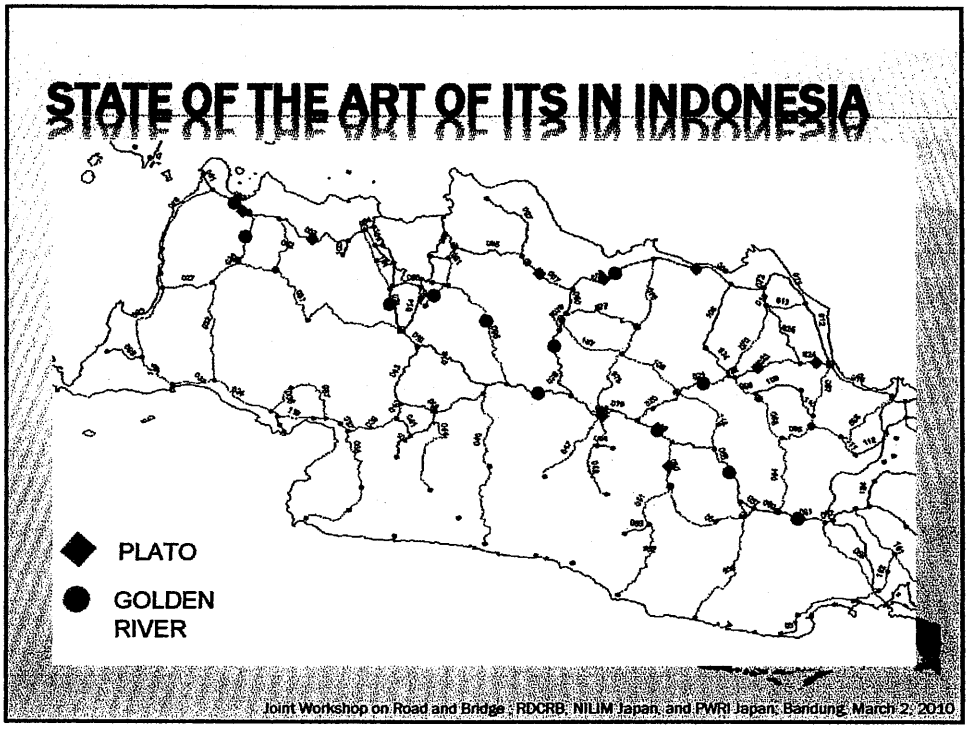
STATE OF THE ART OF ITS IN INDONESIA

- 2006, RDCRB built a prototype of smart card paying systems for toll Gate (touch and go systems)

STATE OF THE ART OF ITS IN INDONESIA

- 2006, RDCRB developed ATC (Automatic Traffic Counter) and installed 4 units on the links of the national highway in West Java

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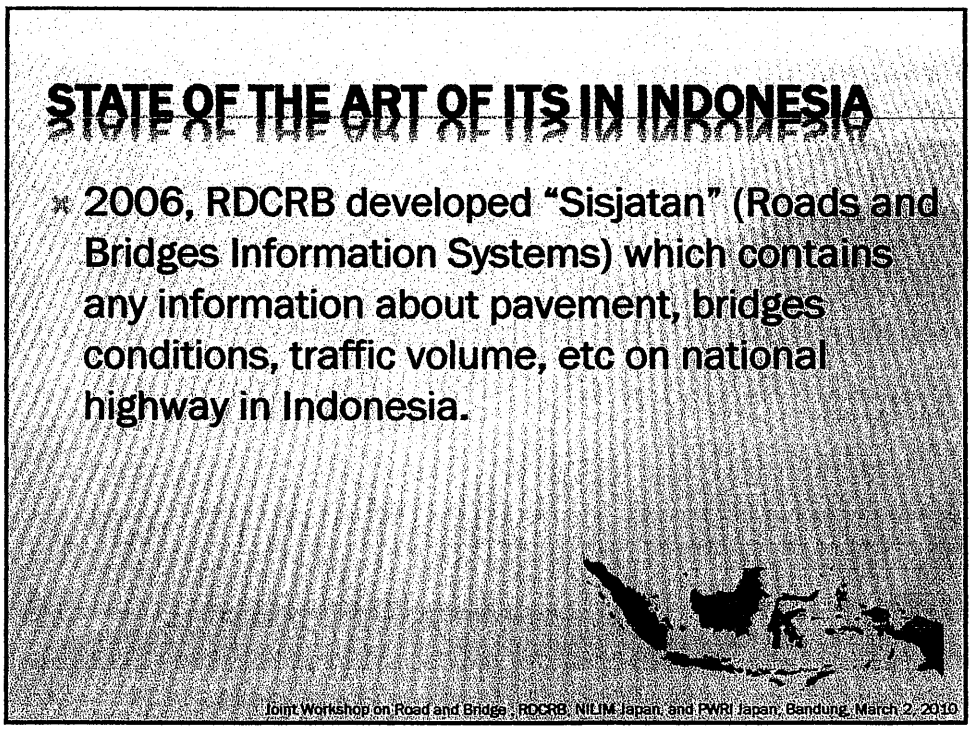
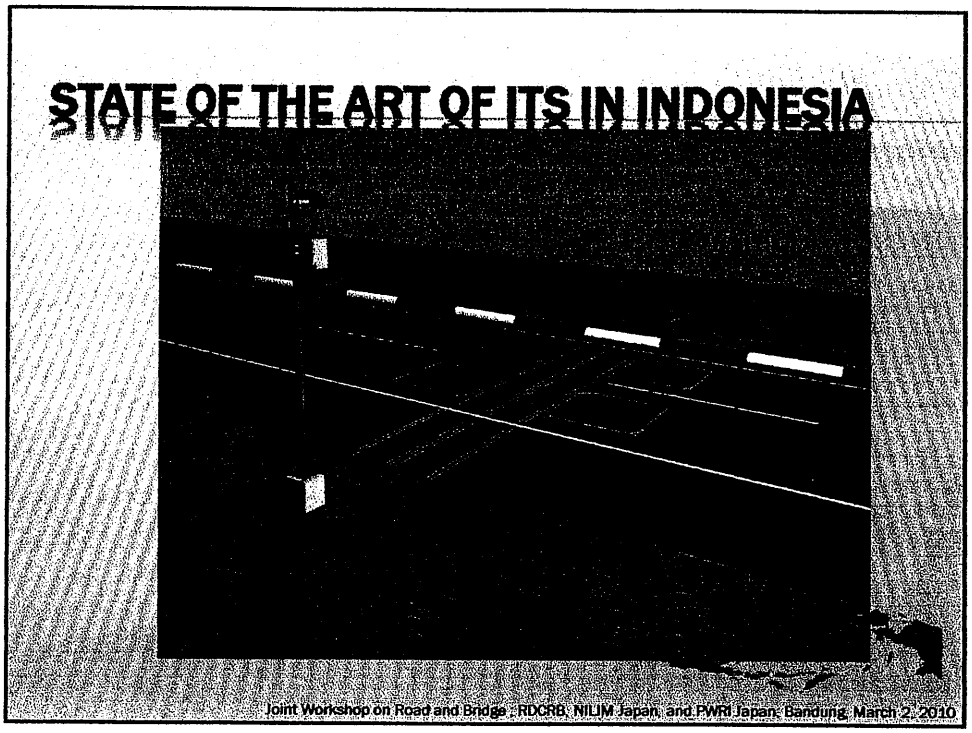

STATE OF THE ART OF ITS IN INDONESIA
2006, RDCRB developed "Sisjatan" (Roads and Bridges Information Systems) which contains any information about pavement, bridges conditions, traffic volume, etc on national highway in Indonesia.
Joint Workshop on Road and Bridge , RDCRB, NILIM Japan, and PWRI Japan, Bandung, March 2, 2010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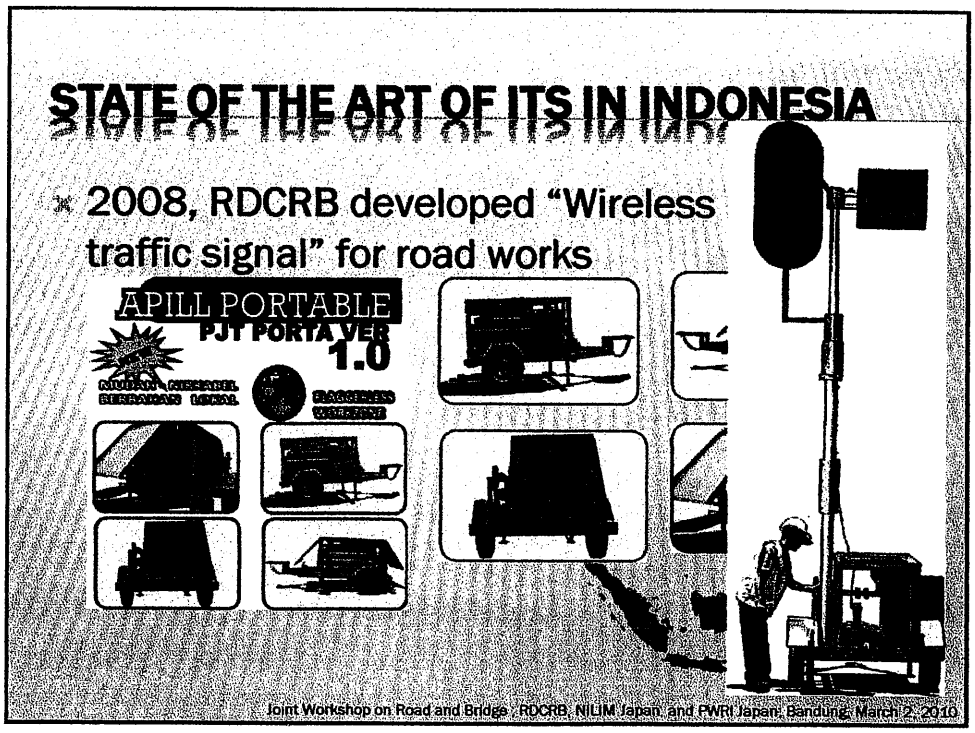
STATE OF THE ART OF ITS IN INDONESIA
2008, RDCRB developed "Wireless traffic signal" for road works
APILL PORTABLE
PJT PORTA VER 1.0
Joint Workshop on Road and Bridge : RDCRB, NILIM Japan, and PWRI Japan, Bandung, March 2, 2010

STATE OF THE ART OF ITS IN INDONESIA

- 2009, e-toll (electronic payment for toll roads) implemented on Jakarta's intercity toll roads (www.jasamarga.com)

STRATEGY ON ITS DEVELOPMENT IN INDONESIA

Ultimate Goal

Safer, smoother, continuous, integrated and environmentally friendly Indonesian Transportation System

STRATEGY ON ITS DEVELOPMENT IN INDONESIA

Targets

a. More effective and efficient use of infrastructure;
b. Enhance the flow of traffic;
c. Better public transport services;
d. Improve safety;
e. Cheaper freight costs; and
f. Reducing the impact on the environment.

STRATEGY ON ITS DEVELOPMENT IN INDONESIA

Prioritization of ITS in RDCRB

Medium term of Indonesian ITS development are:

a. Optimization of Automatic Traffic Counter and axle load detector that have been installed in sections of national roads, and integrate them.
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DISCUSSION

Research and Development Center of Roads and Bridges, in accordance with its duties and functions, has conducted several activities related to information and communication about the road infrastructure such as:

1. Develop the road information system (Sisjatan), which explains about the conditions inside the road infrastructure, road paving, such as data, geotechnical, bridges, and traffic.
2. Develop equipment to measure the elements of roads and bridges condition, and traffic.

Such activities above, prepared as data and road infrastructure conditions for input data of ITS

TERIMA KASIH

NILIM PWRI

ありがとうございました

THE POLICY AND STRATEGY OF ELECTRONIC TOLL COLLECTION SYSTEM APPLICATION IN INDONESIA

Rudy Hermawan Karsaman
Lecture at Bandung Institute of Technology
And Board Member of Indonesian Toll Road Authority

Abstract

In order to smoothly support traffic flows in toll road safely, comfortable and efficient, one of its aspect related to toll collection system adopted. Toll Collection System is activities chain related with toll transaction service to the user, transaction control, administration of revenue collection and other supporting procces. In principle, toll collection system must be rely on quick, precise, secure and comfortable service for the user, ensuring guarantee for the user and operator that transaction has been done in accordance with tarif applied, compatible and integrated with existing or future system and considering technology development and human resources management.

To increase toll road service in Indonesia, the toll collection system or payment transaction aspect at toll gates need to be accelerated. One of the choice to acceleration is to apply toll collection electronically or Electronic Toll Collection (ETC) System.

The advantage of this system adoption are :

1. *Accelarate transaction time and increase service capacity*
2. *Decrease cash moneyneed to be handled and increase security*
3. *Increase transaction accuracy level and avoid human errors*
4. *Increase the efficency of human resource number for toll gates servicing*

In ETC adoption implementation, some of the operators made joint operation in procurement process and operation by pointing one of the Bank as transaction and card manager to ensure the system interoperability in every roads managed by those operatori.

In accordance with the system implementation schedule throught out all toll roads in Indonesia, as first the step and transistion period, this system has been adopted at Jabodetabek area.

This paper discuss the result of implementation so far such as trend of usage, time schedule instalation etc, including recommendation to develop the system further in the future.

Keywords : Toll road, ETC.

I. Introduction

Toll Road as part of National Road has to be maintained operationally to function optimum in accomodating traffic flows secure, efficient and comfortable. One of its aspect related to toll collection system adopted.

Toll Collection System is activities chain related with toll transaction service to the user, transaction control, administration of revenue collection and other supporting procces. In principle, toll collection system must be rely on quick, precise, secure and comfortable service for the user, ensuring guarantee for the user and operator that transaction has been done in accordance with tarif applied, compatible and integrated with existing or future system and considering technology development and human resources management.

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II. System Architecture

System is operated in fully or semi automatic system and designed in modular to ease migration from manual system to fully automatic system. In general this system consists of :

A. Head Quater Central System
B. Communication Network System
C. Toll Plaza Computer System
D. Toll Gate Automatic System
E. Electronic Payment Transaction System.
F. Prepaid Card Payment System.
G. Payment Settlement System

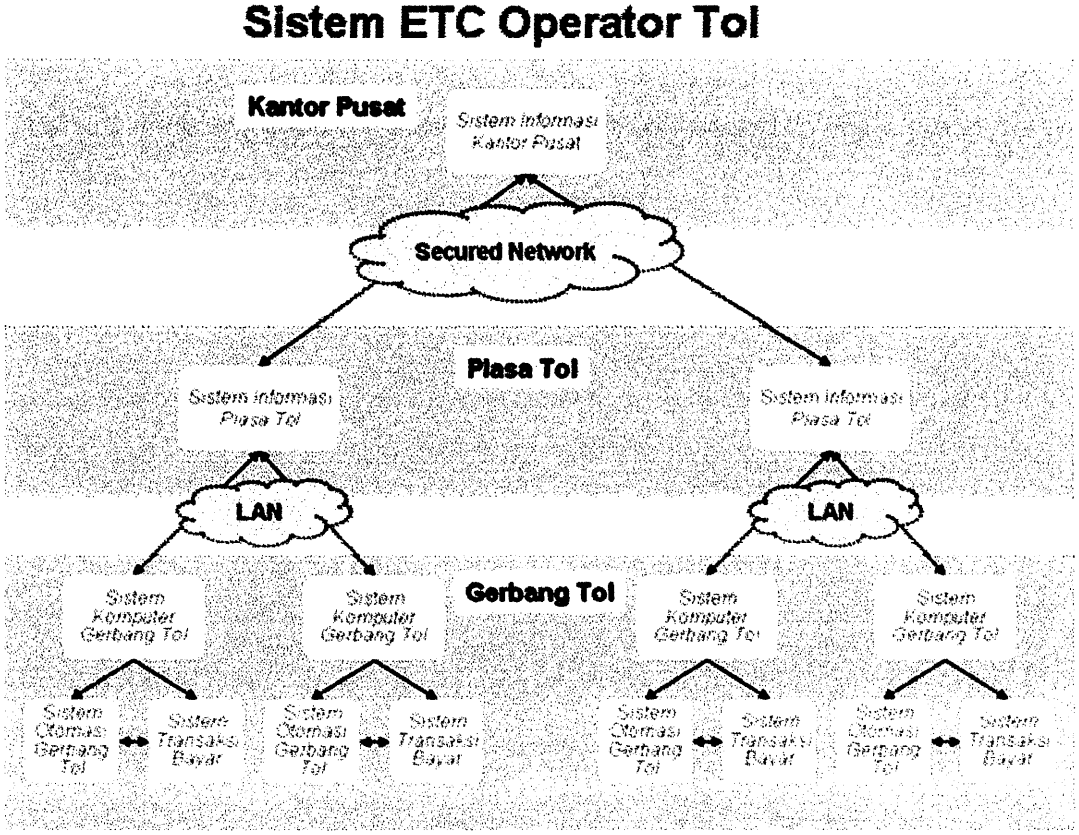

Figure 1. Architecture System

A. *Head Quater Central System*

Information and data analysis system in central office that collect all transaction data for data base, reporting and administering all data. This system consists of *server, peripheral, workstation, router, switch, database* and application software for monitoring and reconsiliation both for internal and external requirement.

B. Communication Network System

Communication Network System that connect Head Quarter and Toll Plaza computer system wich make data communication on-line real-time or on-line batch.

C. Sistem Komputer Plasa Tol

Information and data analysis system at Toll Plaza that can collect transaction data from all toll gates in that plaza for storing, reporting and administering. This system is connected with automatic system and payment transaction system through Local Area Network (LAN).

D. Toll Gate Automatisation System

This system control all transaction process from vehicle identification and classification, payment transaction and problem handling (if any).

E. Electronic Payment Transaction System

This system execute payment process by deducting money value stored in the card and transfer it to operator account.

F. Electronic Card Reloading System

Electronic Card reloading system is issued in accordance with Indonesian Central Bank (BI) regulation. System should be completed by reload-station and easy inter bank transfer and other facilities/features (e.g ATM, EDC or SMS banking).

G. Payment *Settlement System*

Settlement system is required in reconsiliation process amongs toll operator and other user (merchant). This system is developed based on agreement between all parties involved.

The Bank/Clearing house for settlement system is recommended to have characteristic as follows :

- Have large network in Indonesia
- Have corporate and custumor service
- Have electronic banking system.
- Proven as issuer of other electronic card (credit/debit card).

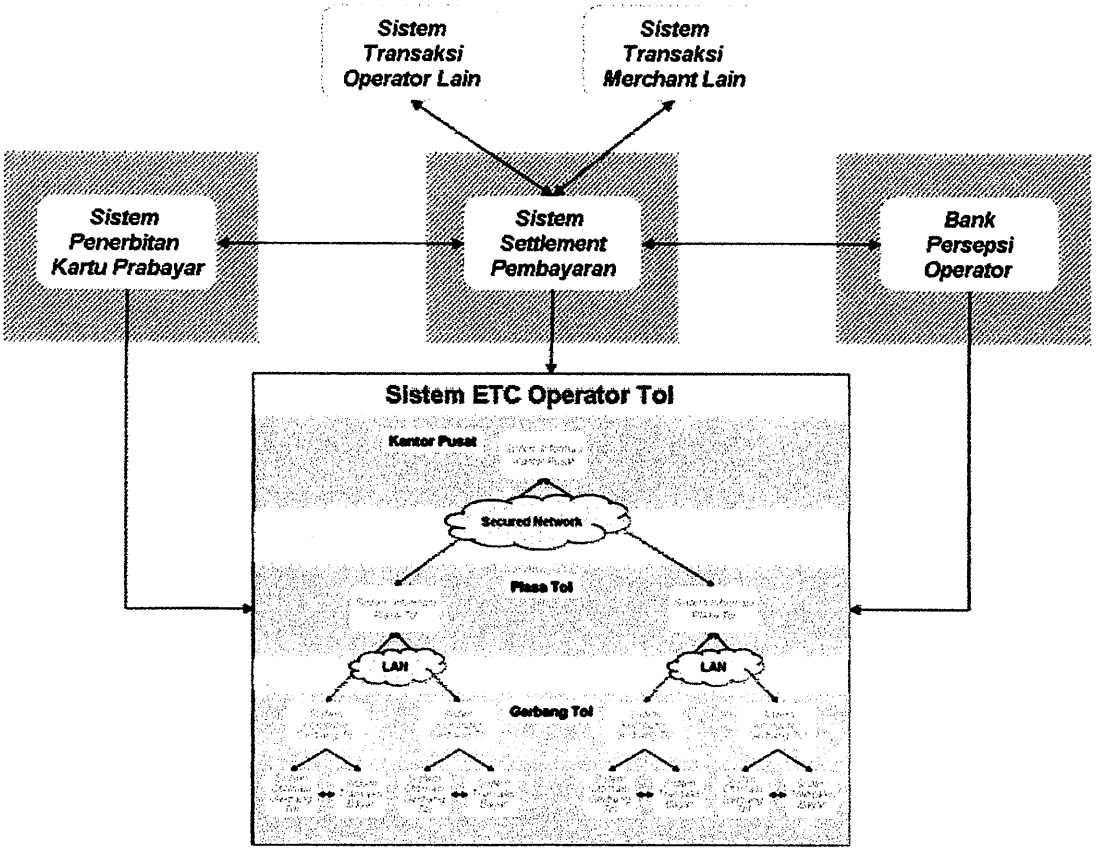

Figure 2 Transaction and Settlement System

III. Operational Arrangement

3.1. Transaction

Transaction coud be done by tap and go and/or free flow (in the future). In certain condition, toll gate could be operated both manual system and electronically.

3.2. Transaction

1. Vehicle enter/exit toll gate and identified its type.
2. *Read card for authentification*
3. If OK, system write related information (gate code, transaction time, vehicle type, tariff, "money" value left etc) and vehicle go through.
4. If not OK, (less "money" value left, card in the black list etc), system activating camera to get vehicle picture, store information on data base

and sending signal or activate alarm for officer to act). Further process can be done manually (vehicle is processed in other place so not to disturb other vehicle or service system). If neccessary, due to high level of system violation, driver could be charged with penalty.

3.3. Card Usage

Card could be used in all toll roads (inter operability) and valid for either close or open systems. Card is specially published and transaction payment is done by deducting money value stored in the card or through periodic billing. For prepaid system, money value could be reload.

IV. Bussiness Management and Payment System

4.1. Basis of Bussiness and Payment

In toll transaction, there is no additional payment, out of toll tariff. Policy of system procurement is given to every operator as long as its meets technical standard and regulation.

4.2. Bussiness Management

Management of ETC is handled by operator consortium with other party that could meet all regulation, including banking and payment system. In this case, this handled by Mandiri Bank. Billing and payment mechanism amongst Mandiri Bank and Operators is based on each toll road transaction through verification and validation proccesses agreed before hand.

4.3. Related Parties and Their Role

The parties involved in this system can be seen in Figure 3. However, their role could be done by same institution :

- *Service Provider / Merchant*
- *Card Holder*
- *Purse Provider / Clearing House*
- *Card Issuers, Load Agents and* Acquirers

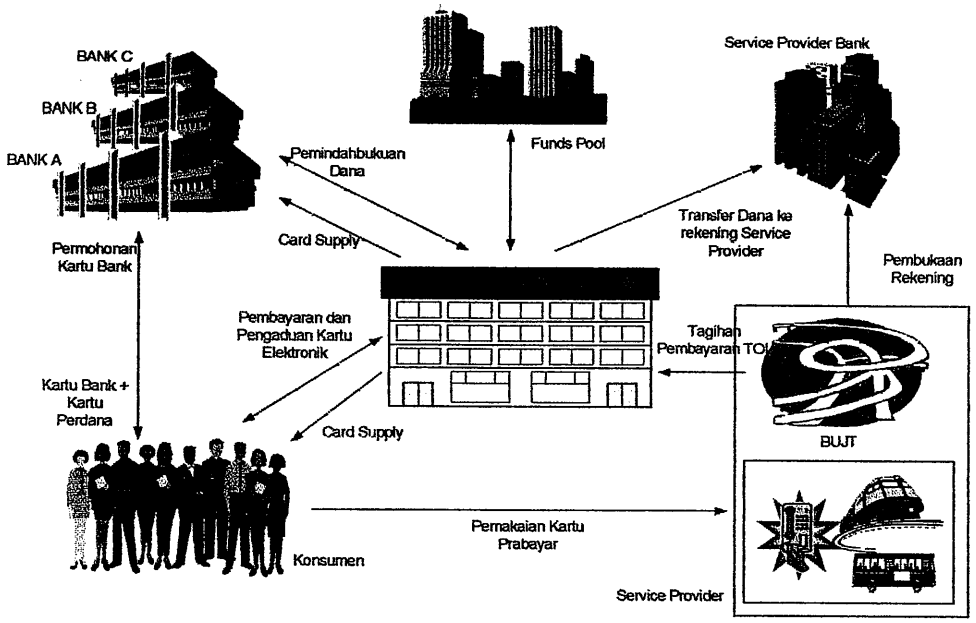

Figure 3 Parties Involved

4.4. Bussiness Process

Based on transaction notes and data, service provider (toll road operator) sending invoice to card issuer and after validated the money is transfered to operator bank. This process is done everyday (or even several time a day) in certain time agreed by all parties.

V. Implementaion Schedule and Transition Period

The application of ETC is scheduled in 2009 – 2010 gradually. This implementation is considering traffic flow, financial and toll gates condition. For future condition, the card could be used for other purpose as well (many merchant) and its stage is illustrated in Figure 4.

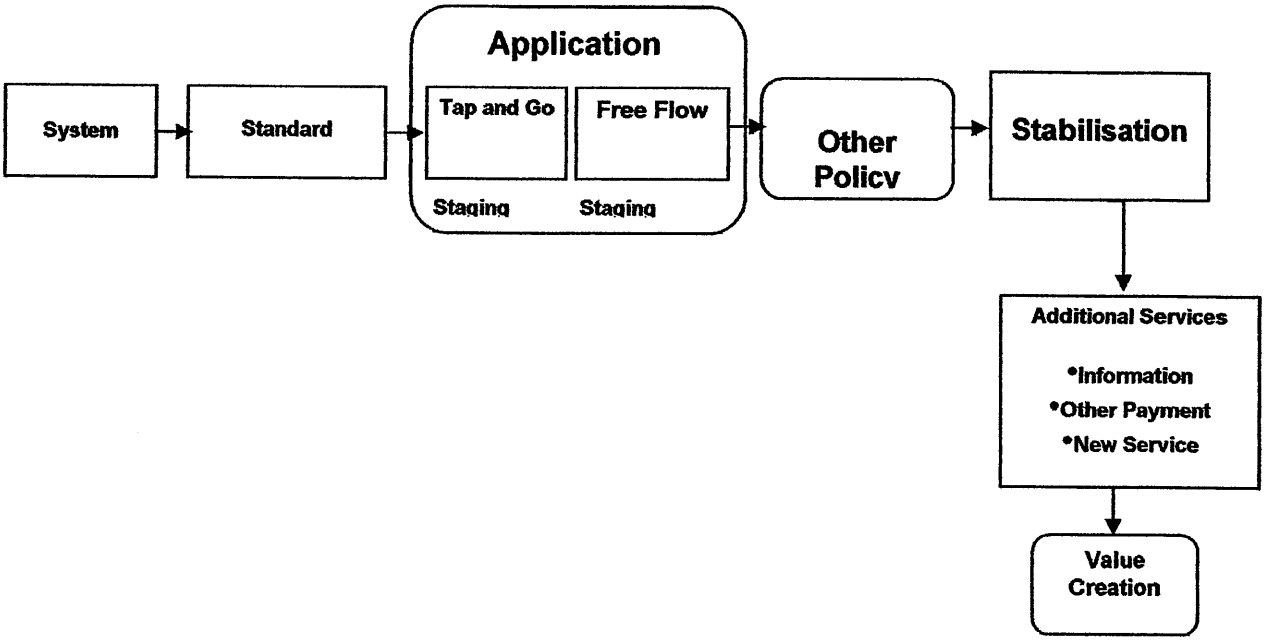

Figure 4 Implementation and Transition Period

In the mean time, the card sold continuosly increase as well as transaction volume. However, there are some issues need to be resolved, i.e transaction failure in some toll gates, transaction data reconsiliation and double debit transaction. In this case, the toll operator and card management continuosly improve the system for better service. To get full advantage of this system, it should be installed in all toll roads as well as give some incentives to the toll road user to use this system.

VI. Acknowledgement

Part of this paper is based on work of ETC implementation team. Therefore I thanks to all member of the team and all toll operators involved. However, any missed interpretation of the content of this paper is on the author

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THE WORKSHOP COMMITEE

DEPARTEMEN PEKERJAAN UMUM
BADAN PENELITIAN DAN PENGEMBANGAN
PUSAT PENELITIAN DAN PENGEMBANGAN JALAN DAN JEMBATAN
JL.A.H. Nasution No.264 Kotak Pos 2 Ujung Berung Tlp.(022) 7802251 Fax : (022)7802726 Bdg. 40294 e-mail pusjal@melsa.net..id

SURAT KEPUTUSAN
KEPALA PUSAT PENELITIAN DAN PENGEMBANGAN
JALAN DAN JEMBATAN
NOMOR : 16 /KPTS/LJ/2010

TENTANG
PENUNJUKAN PANITIA PELAKSANA, PENYAJI MODERATOR, PADA KEGIATAN JOINT WORKSHOP ANTARA RDCRB DAN NILIM

PUSLITBANG JALAN DAN JEMBATAN

KEPALA PUSAT PENELITIAN DAN PENGEMBANGAN JALAN DAN JEMBATAN

MENIMBANG :

a. Bahwa dalam rangka Meningkatkan Optimalisasi Hubungan Antara RDCRB dan NILIM serta untuk melaksanakan pertukaran Informasi yang akan diselenggaraan dalam bentuk Joint Workshop dengan Tema "**Roads dan Bridges Workshop**";

b. bahwa nama-nama yang tercantum dalam kolom 4 (empat) lampiran Surat Perintah ini, dipandang cakap dan mampu untuk melaksanakan tugas sebagai Panitia Pelaksana, Pembicara, Moderator, pada kegiatan Joint Workshop;

c. bahwa untuk maksud tersebut di atas perlu ditetapkan dengan Surat Keputusan.

MENGINGAT

1. Peraturan Menteri Pekerjaan Umum Nomor : 286/PRT/M/2005 tentang Organisasi dan Tata Kerja Departemen Pekerjaan Umum;
2. Keputusan Menteri Pekerjaan Umum Nomor : 324/KPTS/M/2007 tanggal 1 Agustus 2008 tentang Pembebasan dan Pengangkatan Pejabat Pimpinan Eselon II.a di lingkungan Departemen PU;

MEMPERHATIKAN Memorandum Concerning the Cooperation Activities Between Research and Development Centre for Roads and Bridges, Research and Development Agency, Ministry of Public Works, Indonesia and National Institute of Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism, Japan tanggal 11 November 2009.

M E M U T U S K A N

Menetapkan : **KEPUTUSAN KEPALA PUSAT PENELITIAN DAN PENGEMBANGAN JALAN DAN JEMBATAN TENTANG PENUNJUKAN PANITIA PELAKSANA, PENYAJI, MODERATOR, PADA KEGIATAN JOINT WORKSHOP**

Pertama : Menunjuk nama – nama yang tercantum dalam lampiran Surat

Keputusan ini, selain melaksanakan tugas pokok juga melaksanakan tugas sebagai berikut :

1. Panitia Pelaksana :
   a. Mempersiapkan pelaksanaan Joint Workshop RDCRB dan NILIM.
   b. Melaksanakan Joint Workshop yang akan diselenggarakan selama 2 (Dua) secara tepat waktu dan tepat mutu.
   c. Membuat laporan akhir kemudian diserahkan kepada Kepala Pusat Litbang Jalan dan Jembatan.
2. Moderator :
   a. Memimpin persidangan.
   b. Membuat resume persidangan.
3. Penyaji :
   Menyajikan dan Mempresentasikan makalah.

Kedua : Segala biaya yang diakibatkan dengan terbitnya Surat Keputusan ini, dibebankan kepada RDCRB dan NILIM ;

Surat Keputusan ini mulai berlaku sejak tanggal ditetapkan dan berakhir setelah pelaksanaan Joint Workshop selesai dengan ketentuan akan dilakukan perbaikan atau perubahan sebagaimana mestinya.apabila dikemudian hari terdapat kekeliruan dalam penetapan Surat keputusan ini.

Tembusan Surat Keputusan ini disampaikan kepada Yth.:
1. Bapak Kepala Badan Litbang PU, sebagai laporan;
2. Sekretaris Badan Litbang PU;
3. Pejabat Komitmen di lingkungan Puslitbang Jalan dan Jembatan;
4. Kepala Bagian/Bidang/Balai Pusat Litbang Jalan dan Jembatan;
5. Yang bersangkutan untuk dilaksanakan.

DITETAPKAN DI : **BANDUNG**
PADA TANGGAL : **12 Februari 2010**

K E P A L A,

DEPARTEMEN PEKERJAAN UMUM ★ BADAN PENELITIAN DAN PENGEMBANGAN ★ PUSAT PENELITIAN DAN PENGEMBANGAN JALAN DAN JEMBATAN

Ir. Agus Bari Sailendra, MT.
NIP 19510811 198003 1 002

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Lampiran : Surat Keputusan
Kepala Pusat Litbang Jalan dan Jembatan
Nomor : 16 /KPTS/LJ/2010
Tanggal : 12 Februari 2010

SUSUNAN KEPANITIAAN
JOINT WORKSHOP RDCRB DAN NILIM
TAHUN 2010

NO	KEDUDUKAN	JABATAN	NAMA
1	2	3	4
A.	PENGARAH	Kepala Pusat Litbang Jalan	1. Ir. Agus Bari Sailendra, MT
B.	PENANGGUNG JAWAB	Kepala Bidang Program dan Kerjasama	1. Ir. IGW. Samsi Gunarta, M.AppL,Sc
C.	KETUA		1. Hindun Hasanah, SE
D.	WAKIL KETUA		2. Rakhman Taufik, ST, M.Sc
E.	SEKRETARIS		3. Drs. Endang Fauly, Dipl. TEFL
F.	ANGGOTA		
a.	Kesekretariatan		
			1. Ati Dwiyanti
			2. Tika Mustikasari, SE
			3. Ani Mulyani, S. Sos
b.	Persidangan		
			1. Nana Sumarna, ST, MM
			2. Iman Santosa, ST
			3. Dimas Sigit Dewandaru, S.Kom
			4. Dadi Muljadi
			5. Arief Bachtiar
c.	Notulen		
			1. Andi Sata, ST, MT
			2. Gede Budi Suprayoga, ST, MT
d.	Ruangan dan Acara		
			1. Dra. Loida Dasuha
			2. Dewi Siti Baiduri, ST
			3. Didin Sarifudin, SH
			4. Diah Rumdiani, A.Md
			5. Nana Rohandi
h.	Umum		
			1. Heri Sarifudin
			2. Enjang Wikusnadi
			3. Epih Rodiansyah
			4. Nurdiansyah
			5. J. Mihardja
			6. Ana Permana
G.	MODERATOR		1. Dr. Ir. M.Sjahdanulirwan, M.Sc

+

H.	PAKAR/ PRAKTISI/ PEMBICARA KHUSUS	
a.	Penyaji	1. Prof (R) Dr. Furqon Affandi, M.Sc
		2. Ir. Nyoman Suaryana, M.Sc
		3. Ir. Nono, M.Sc
		4. Ir. Kurniadjie, M.Sc
		5. Ir. Nandang Sjamsudin, MT
		6. Ir. Pantja Dharma O, M. Eng.Sc
		7. Redrik Irawan, ST, MT
		8. Badan Pengatur Jalan Toll.

DITETAPKAN DI : BANDUNG
PADA TANGGAL : 12 Februari 2010

K E P A L A,

Ir. Agus Bari Sailendra, MT.
NIP 19510811 198003 1 002

File:D/PKSK/Kepegawaian/B-Statuter/SPRIN/SPRINKolokium1 2010

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ISBN: 987-602-8256-15-5

2.4. 調査報告

国総研は共同ワークショップ開催時に、研究ニーズの具体的な内容について把握のためにアンケート調査を行ない、とりまとめを行なったので報告する。

調査報告　目次

１．アンケートの作成

１－１．インドネシアの研究ニーズを把握する質問の作成

インドネシアの関係機関における舗装、橋梁、ITS 等、関連分野の研究ニーズを把握するための調査方法として、3 月に開催した「INDONESIA /JAPAN-JOINTWORKSHOP in BANDUNG Held by RDCRB and NILIM/PWRI」においてアンケート調査を実施することとした。

アンケートは、次回の開催テーマに関して、現在関心を持っているテーマを選定していただく形式とするともに、その中で特に重要と考えている２題について、その具体的な内容を求めることとした。

アンケートの作成にあたっては、舗装、橋梁、ITS に関する項目をいれることはもちろんであるが、ＷＳが幅広の内容を対象としているため、それらを踏まえて質問には計画段階から、維持管理まで幅広く 12 の項目を設定することとした。

作成したアンケートを次節に示す。

１－２．アンケートの内容

アンケートの質問部分について、実際に用いた英文を表－１に、参考として和文を表－２に示す。

表－１　WS に用いたアンケート（英文）

○　**What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ?**
When you hit upon some ideas, please check on the blanks(レ) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Regulation ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
☐Maintenance and related issues ☐ITS (Intelligent Transport Systems) technology.
☐Execution and maintenance of the pavement（including high-performance pavement）
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☐Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: **Disaster Management**
Content：Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content：

Selected Topic:
Content：

表－２　WS に用いたアンケート（和文：参考）

○次回のワークショップでどのようなテーマを扱ってもらいたいと思いますか？ご意見がある場合は、下記の□にチェックを入れて頂くとともにできるだけ具体的にご意見の内容を記載してください。

□実施計画と規制　□評価を含む、投資と優先順位
□道路と橋（耐震補強技術を含む）の建設技術
□維持補修と関連した問題　□ITS（高度道路交通システム）技術
□舗装の施工と維持補修（高機能舗装を含む）
□土木技術における判断を含む能力開発　□調達システム
□災害のマネージメント　□道路の安全性　□気候変動を含む環境問題
□経済と道路プロジェクトとの関連　□その他

上記の項目は複数選択可能です。選択項目については、個々について下欄に具体的に記載いただけますと幸いです。

【例】
選択項目: 災害管理
内　　容: 東部ジャワ地域の山間部で道路災害が発生した際に、道路管理者と道路利用者間のコミュニケーションシステムが整備されていないため、通常の場合、復旧工事着手まで３日を要し、地域の社会・経済活動に多大な損失を与えている、など。

選択項目:
内　　容:

選択項目:
内　　容:

２．アンケートの集計

アンケートは、ワークショップの参加者全員に配布し、19 人より回答をいただいた。アンケートの回答結果を整理し、以下に示す。整理は、作成した質問も含めて、全ての設問とした。なお、回答のうち、4 人はインドネシア語での回答であった。

回答原文は、参考資料として巻末に示す。また、各意見の丸付き数字は回答原文の番号を示している。

２－１．アンケートの集計結果

（1）ワークショップの評価

表－３　ワークショップの評価の整理

	5 (Excellent)	4	3	2	1 (Not Good)	合計
(1)全体セッション	4	10	3	0	0	17
(2)-1 専門セッション1 （舗装と道路）	2	3	1	0	0	6
(2)-2 専門セッション2 （災害と橋梁）	2	2	1	0	0	5
(2)-3 専門セッション3 （交通と技術）	2	9	0	0	0	11
(3) 専門セッションの討議	5	7	3	0	0	15

（2）最も興味深かったこと

1）特定の発表あるいはセッションを回答したもの

・専門セッション 1(舗装と道路)の"Pavement Maintenance Strategy in Japan" と回答　1 名

・専門セッション 2(災害と橋梁)の"The Need and Development for Bridges Strengthening Technology in Indonesia" と回答　1 名

・専門セッション 3(交通と技術)　と回答　2 名

・専門セッション 3(交通と技術)の ITS　と回答　1 名

・専門セッション 3(交通と技術)の"Local ITS Strategy" と回答　3 名

・専門セッション 3(交通と技術)の"Role of structure condition data acquisition on bridge maintenance activities" と回答　2 名

・専門セッション 3(交通と技術)の" Strategy on ITS Development in Indonesia" と回答　1 名

2）自由に回答いただいたもの

①日本には MCI（メインテナンス管理指数）というメンテナンス管理目標値がありますが、我々は、その日本の指標を得ることが可能ですか。どのような方法で、例えばインターネットでダウンロードできるのですか。

②インドネシアにおける橋梁の構造の健全性、交通スマートシステムに関するモニタリングシステムついて（ただし、実地についてはどうか？）

④今回のワークショップはとても良かったです。しかし、国総研は多くのアスペクトを網羅するため、総合的に行う方がよいと考えます。各研究開発センターがこのようなワークショップに参加できる機会を与えられたらさらに良かったと考えます。

⑦基本的な ITS：・狭隘道路での運転サポートシステム

・“バリアが無い停止地点”での安全サポートシステム

⑬ITS は車両の動きと道路状況に充分な注意を払うべき

⑮技術は進歩しているが、弱点と欠点も絶えずついて回るものである。人的資源はどうか？技術が発展するにつれ雇用が失われる。最も大事なことは、運転者の運転態度である。

⑲2003 年の地震時に確認された脱座席防御のために効果を発揮する多目的安全システム

（3）次回のワークショップのテーマ

表－4　次回のワークショップのテーマの整理

項目	人数				備考
	全体	TSⅠ	TSⅡ	TSⅢ	
アンケート回答者数	19	6	5	11	
項目3の回答者数	12	3	3	7	
・実施計画と規制	4	1	0	3	
・評価を含む、投資と優先順位	2	1	0	1	
・道路と橋（耐震補強技術を含む）の建設技術	5	2	2	0	
・維持補修と関連した問題	3	1	2	0	
・ITS（高度道路交通システム）技術	7	3	1	4	
・舗装の施工と維持補修（高機能舗装を含む）	1	1	0	0	
・土木技術における判断を含む能力開発	3	1	2	0	
・プロキュアメントシステム	1	0	0	1	
・災害のマネージメント	2	1	1	0	
・道路の安全性	7	1	0	5	
・気候変動を含む環境問題	4	1	0	3	
・経済と道路プロジェクトとの関連	3	1	0	2	
・その他	1	0	0	1	・都市部の道路

注：「項目３の回答者数」は項目３で１項目以上選択した方をカウントした。
参加者には複数の専門セッション(TS)に参加した方や TS に参加しなかった方いるため、TS の合計と全体の数は一致しない場合がある。

各項目に対する具体的な内容等のコメント

a）実施計画と規制

⑬道路状態は運転時の安全性を決める要因となるので道路は充分に整備されるべきである。

b）評価を含む、投資と優先順位

①質の高いプロジェクトにおける成果要因からみて、いろいろな異なる地域でのプロジェクトに関する研究

c）道路と橋（耐震補強技術を含む）の建設技術。

⑲長大橋の設計及び建設技術、地震の断層の影響への抵抗(スンダ海峡)、耐風安定性の試験方法。

d）維持補修と関連した問題

①補修の寿命、過負荷、使用される補修資材に関する研究

⑲地震などの災害後の道路、橋梁ネットワークを迅速かつ効率的にリハビリするための復旧プログラム

e）ITS（高度道路交通システム）技術

②国や県レベルの道路の交通システムのプログラム計画手法について.

④道路開発者によってもたらされる交通渋滞や将来における課題。解決のためには技術を伴う新たなアプローチを必要とするが、一方で利用者側の（課題解決へ向けた）アプローチも必要。

⑧インドネシアに独特な状況に対して適切なITSを知るために良いワークショップの機会だった。

⑮幾つかの箇所での交通混雑による問題を解決するために人的資源と共に進んだITSシステムの導入が必要である。交通混雑は多くの問題を引き起こす原因となっている。現場での活動に着手するよりもシステム確立を優先すべきである。良いシステム構築には時間を要すると思うが。

f）舗装の施工と維持補修（高機能舗装を含む）

コメント無し

g）土木技術における判断を含む能力開発

コメント無し

h）調達システム

コメント無し

i）プロキュアメントシステム

コメント無し

j）災害のマネージメント

コメント無し

k）道路の安全性

⑨道路標識と利用者の間の管理システムの欠如(バイクを含むあらゆる種類の車両について)

⑪幅が狭い道における通行者の発見。

⑪夜に道を渡る通行者の発見。

⑭インドネシアの道路における事故の最小化。

⑮依然として無駄に命を落とす人々が大勢いる。この問題は早急に解決されるべきである。

l）気候変動を含む環境問題

⑧道路事業における環境問題を支援するためにどのような努力を払うべきか？このワークショップではエコな道（Green road）や排水システムなどの環境関連事項に対処するための詳細について知見を与えてくれるであろう。

⑭環境面に基づいた交通手段の構築。

m）経済と道路プロジェクトとの関連

コメント無し

n）その他

②道路利用者へ良いサービスを提供するための官側の課題（規則、道路の運営や道路利用者)如何に管理を行うか？

２－２．アンケート結果の分析

ここでは、２－１で集計したアンケート結果のうち、本業務に関係する、「次のワークショップのテーマ」についてアンケート結果から分析する。

「次のワークショップのテーマ」については、回答のあった 19 人の中で、12 人が項目を選択し、その他を含んだ 13 項目に 43 の選択が行われた。その中で、最も多くの人から選択されたのが「ITS（高度道路交通システム）技術」と「道路の安全性」であり、項目選択をした 12 人のうち、半数以上の 7 人により選択された。なお、既に検討テーマと決定している３件の選定数と順位は以下のとおりである。

・舗装「舗装の施工と維持補修（高機能舗装を含む)」　１人（11 位／12 件）
・橋梁「道路と橋（耐震補強技術を含む）の建設技術」　5 人（3 位／12 件）
・ITS「ITS（高度道路交通システム）技術」　7 人（1 位／12 件）

注：順位付けには「その他」は含んでいない。

また、上記を表－４に示すセッションごとの参加者に分けて整理すると、特徴的な点は以下のとおりである。

・選択数１位の「ITS 技術」は「舗装と道路」のセッション参加者全員が選択しており、「交通と技術」のセッション参加者からの選択も多い。一方、「災害と橋梁」のセッション参加者は選択していない。
・同様に選択数１位の「道路の安全性」は、主に「交通と技術」のセッション参加者が選択している。

今回のアンケートは回収数が少なく、一部から全体を類推するのは困難であるが、１つの見方として、

・各セッションの重みは同程度である。
・一部の回答者は、セッション参加者の総意を代表している。

という前提条件だと仮定すると、表－４に示す各項目の評価は表－５のようになり、上位３項目は以下のようになる。

１位：ITS（高度道路交通システム）技術　63%
２位：道路と橋（耐震補強技術を含む）の建設技術　44%
３位：道路の安全性　35%

表－５　次回のワークショップのテーマの整理（その２）

項目	TS Ⅰ	TS Ⅱ	TS Ⅲ	平均
・実施計画と規制	33%	0%	43%	25%
・評価を含む、投資と優先順位	33%	0%	14%	16%
・道路と橋(耐震補強技術を含む)の建設技術	67%	67%	0%	44%
・維持補修と関連した問題	33%	67%	0%	33%
・ITS(高度道路交通システム)技術	100%	33%	57%	63%
・舗装の施工と維持補修(高機能舗装を含む)	33%	0%	0%	11%
・土木技術における判断を含む能力開発	33%	67%	0%	33%
・プロキュアメントシステム	0%	0%	14%	5%
・災害のマネージメント	33%	33%	0%	22%
・道路の安全性	33%	0%	71%	35%
・気候変動を含む環境問題	33%	0%	43%	25%
・経済と道路プロジェクトとの関連	33%	0%	29%	21%

なお、主要な項目に対する意見の中には、具体的な研究ニーズもいくつか含まれているため、それらについては、研究ニーズに取りまとめる。また、別の設問である「最も興味深かったこと」からもニーズと考えられるものは、幅広に取り上げ、研究ニーズとして記載するようにする。

３．WSのとりまとめ

ワークショップでは､表－３に示す３つの技術セッションで､各セッションのとりまとめが行われた。このとりまとめにも、インドネシアのニーズが含まれるため、研究ニーズの参考になると考えられる部分については和訳を以下に示す。

３－１．専門セッション１（舗装と道路）

（1）討論、検討の結果

① 日本とインドネシアの間では、アスファルトの性状および施工の方法について、特に品質管理の点で大きな違いがあることが確認されている。また、「Asbuton(ブトン天然アスファルト)」のようなインドネシア固有の技術は日本では高価であると考えられており、日本では橋梁の防水工事に使われる程度である。日本は洗練されたインドネシアの技術に期待する。
日本は多孔質アスファルト舗装や舗装道路のモニターシステムのような新鋭技術に優位性を持っており、こういった技術をインドネシアで利用することで、効率的な舗装道路の管理を行うことが可能となる。

② インドネシア同様、日本も種々のタイプのアスファルトミックスを開発している。

③ 舗装道路の修理を行う際、日本は「ひび割れ率」と「わだち割れ深さ」を重要な指標として使っているが、これはもともと AASHTO(American Association of State Highway and Transportation Officials) (PSI)から来たものである。

④ 日本では多孔質アスファルトは主として高速道路で使用され、排水を良くし、水しぶきや水はねを減少させ、安全を確保するために使用されている。また、多孔質のアスファルト表面に目詰まりが出来るのを防止するため、最先端の技術が開発されている。

⑤ 日本では、道路の状況を示すデータを採集するため、毎日 50～100km の区間に渡って目視でパトロールを行っている。また、3 年毎に道路表面測定装置を用いた測定を行う。

⑥ Asbuton（ブトン天然アスファルト）の評価をする際、初期の建設コストのみならず、ライフサイクルコストをも加味して評価する必要がある。Asbuton が高価な理由は、輸送費がかかることに加えて、採掘した原鉱からアスファルト留分を抽出する手間がかかることによる。Asbuton（ブトン天然アスファルト）の件に関して日本側としては、関連する業界の協力を得てインドネシア側を援助する用意がある。

⑦ 日本はトリニダードにあるピッチレイク（アスファルト沼）で取れる天然アスファルトを使用しているが、これは道路舗装用ではなく橋梁の鋼製デッキ部の防水用であり、これにより水の浸入による腐食から鋼製デッキ部を守っている。

⑧ 降雨で浸水する道路については、インドネシアでは単にかさ上げをするか剛性の高い舗装にするだけである。日本では常に洪水状態になるような道路はないので、この問題に関する助言は限られたものとなる。日本は現在、道路の表面からすぐに滲みこむ透水性のある舗装を開発中

である。また日本の経験によれば剛性の高い舗装は推薦できない。その理由は柔軟性のある舗装に比べるとメンテナンスが非常に複雑になるからである。

⑨ 日本ではアスファルトによる安定処理路盤はセメント処理路盤よりも広く一般的に使われている。その理由は、セメント安定化処理路盤（CTB）は剛性が高いためメンテナンスが難しいことによる。

⑩ 道路表面測定装置を使うと、カメラと画像アナライザーを用いて、「ひび割れ率」（クラック面積と全面積との比）が自動的に測定できる。

⑪ 舗装に関する問題は、討議をおこなうこともさることながら、現場を見て解決することも必要である。このため日本側の専門家はさらにインドネシアに行って協議を行いたい。

⑫ インドネシアには約52%の未舗装道路がある。今後建設予定の簡易舗装とLow Volume Roadについての計画はRDCRBが作成している。それによると2010年は未舗装道路に焦点を当て、翌年以降は簡易舗装とLow Volume Roadに焦点を当てることになっている。日本は簡易舗装の開発も行っている。このため今後簡易舗装と低交通量道路についての協力も必要となる。

（2）共同研究のテーマ

共同研究のテーマとして以下の事項が挙げられた。

① 舗装管理システム、メンテナンス用資材とモニターの方法を含む

② 現場リサイクル法などの最新技術や、高いわだち割れ抵抗（例えばStone Mastic Asphalt）、低騒音舗装や透水性舗装。

③ Asbuton（ブトン天然アスファルト）に関する技術開発

④ 簡易舗装と低交通量道路に関連する技術

３－２．専門セッション２（災害と橋梁）

（1）討論、検討の結果

日本とインドネシア双方が興味を持っている共通のテーマが既にある。それは耐震設計、道路橋の補強、地震後の危機管理であり、以下の点が議論された。

① 地震後の構造物補修の方法は、被害の程度と橋梁の劣化度合いに左右される

② 地震災害を軽減するため、以下の３つの基本方針が、日本の国総研によって紹介された

a. 橋梁に対する耐震設計の仕様

b. 橋梁の耐震補強

c. 地震後の速やかな道路ネットワークの復旧

③ 地震による橋梁被害の４つの要因をRDCRBが指摘した

ａ． 橋梁上部工の横方向の動き

ｂ． 橋梁上部工主要部と追加構造物との間の横方向の膨張

ｃ． 橋梁の沈下による、橋梁盛土への接近

ｄ． 擁壁および橋台に発生した亀裂

④ 過荷重は橋梁破壊の原因であるが、インドネシアではよく見られる

⑤ 長大橋梁に関する日本の技術情報は、日本の国総研によって提供される

（2）研究情報交換のテーマ

相互に興味のある下記のような情報を交換することが有意義であろう

① 地震災害の評価（決定論的な、あるいは確率論的な地盤振動の予測）
② 津波情報をも含む地震災害情報
③ 情報伝達に関わる技術、特に、即座に情報収集をするとともに関係者間で情報を共有できるような形の技術
④ 緊急に対応、周知できるような地震被害予測
⑤ 道路橋の耐震設計技術
⑥ 道路橋の耐震補強技術
⑦ 地震後の道路橋の耐震性評価
⑧ 地震で被害を受けた道路橋の緊急復旧方法
⑨ 道路橋の崩落防止法

3－3．専門セッション3（交通と技術）

（1）討論、検討の結果

日本は ITS 技術も進んでいる。狭い道路で逆方向から来る車があると警告したりするものであるが、インドネシアでも使える技術である。

① 地方の ITS 戦略：濱田俊一氏の内容

最近開発された ITS 技術の全容と、特に地方における狭い道路での ITS 技術の応用について発表があった。この ITS の装置は簡易で比較的安価であり、狭い道路に進入する車両に対して指示を与えドライバーが道路に進入すべきか道路が空くまで待つべきかを教えるものである。

このタイプの ITS 技術は住宅地域の狭い道路での導入が適切であり、反対方向から車両が来ていることを知らずに双方から進入して、どちらにも動けなくなる状態を避けることができる。

この ITS 技術とその応用に関しては、更に詳細にインドネシア側の技術者、研究者に紹介していただきたい内容である。

② 橋梁のメンテナンスのための構造データの取得について：小西拓洋氏の内容

橋梁の劣化度合いをモニターするための ITS 技術について発表があった。これはストレーンゲージを用いて、トランスミッターに接続して、事務所のコンピュータに情報を転送するものである。同じような技術で車両の重量を測ることができるため、交通に対する負荷を探知することも可能になる。このタイプの ITS 技術は車両の重量分布をモニターする点で、インドネシアにふさわしい。この装置の簡便性、適用性、経済性、耐久性等がインドネシアの現状にふさわしいか、評価されるべきである。インドネシアの道路網における過積載の問題からは、このシステムが簡便で操作が容易であることがふさわしいと思われる。

③ 電子料金徴収システムをインドネシアに導入するための政策と評価：Rudy Hennawan 博士の内容

ETC による料金徴収システムについて発表があった。このシステムはスマートカードを用いてカードリーダーにタッチすることで料金を支払うものである。これは料金支払いブースに代わるものであり、現在の ETC の取扱量は約 10%程度である。残りは人の手で徴収する。将来このシステムは更に改良さ

れて、タッチしなくても良いようになる。このようなシステムを将来導入するためには、ドライバーに対する教育等が必要になる。

④　インドネシアにおける ITS 発展戦略：Pantja Dharma Oetojo 氏の内容

連動した交通管制システムについて発表があった。これはジャカルタやバンドンのような都市部で用いられているものであるが、ある事情で多くのシステムが、一部のみ用いられるか、使われないで独立型の従来型信号に逆戻りしているとのことである。

また、RDCRB の事務所では、交通の研究者は軸負荷を計測して遠隔通信システムで事務所にデータ転送できる「自動交通量分類計測器」などの交通管理機器の開発に従事している。そのほかにも交通情報、あるいは他の道路データを関係者がアクセスできるシステムがある。移動式の無線スタンドアロン交通信号は工事現場の交通整理に使用される。しかし RDCRB の行うこれらの研究は未だ開発途上にあるとのことである。RDCRB では、電子機器の開発が出来る専門家が不足している。

緊急の都市交通の問題点は、大量の二輪車の問題である。ITS を使ってこの問題を解決するには格段の配慮を要すると考えられる。

（2）共同研究のテーマ

以下のテーマが望ましい。

①　低コストで、設置が容易で、実現可能性のある地方の ITS
②　高速道路の交通管制、モニター技術、ETC の採用
③　交通安全と渋滞緩和

４．インドネシアの状況

研究ニーズの把握にあたり、認識しておくべきインドネシアの道路に関係する情報として、車両の保有台数、道路延長を調べるとともに、WS 参加者の意見として多かった交通事故に関係する数値を以下に示す。

数値情報はインドネシア政府より公表されていた情報を整理し以下の表に示す。インドネシアでは、表－６に示すように、特に 2003 年から 2008 年にかけて車両保有台数が約 2.5 倍になっているのに対し、表－７に示すように道路延長はさほど増えていない。そのような中で、交通事故の数値も増減はあるが（表－８）、事故車両数等は急増しており、オートバイの数が急増している（表－９）。このような交通事故に関する状況が、「ITS（高度道路交通システム）技術」と並んで「道路の安全性」が次回のワークショップのテーマ選択の１位となった意見に現れたのではないかと推測される。

①インドネシアの車両台数

表－６　インドネシアの車両保有台数（台）

西暦	乗用車	バス	トラック	オートバイ	合計	5 年間増加率
1988	1,073,106	385,731	892,651	5,419,531	7,771,019	－
1993	1,700,454	568,490	1,160,539	7,355,114	10,784,597	139%
1998	2,769,375	626,680	1,586,721	12,628,991	17,611,767	163%
2003	3,885,228	798,079	2,047,022	19,976,376	26,706,705	152%
2008	9,859,926	2,583,170	5,146,674	47,683,681	65,273,451	244%

＊インドネシア中央統計庁 HP より

②道路延長

表－７　インドネシアの道路延長（km）

西暦	国道	県道	地方道	市街地道路	有料道路	合計	前年比増加率
2004	34,629	46,498	229,080	21,863	660	332,730	－
2005	34,318	46,771	229,208	21,934	772	333,033	100%
2006	34,318	46,771	229,208	21,934	772	333,033	100%
2007	36,318	50,044	245,253	23,469	772	355,856	107%
2008	36,318	50,044	245,253	23,469	772	355,856	100%

＊インドネシア運輸省 HP データより

③交通事故数

表－８　交通事故関係数

西暦	事故数（件）	事故車両（台）	死傷者数（人）	死者数		重傷（人）	軽傷（人）	損失額(BR)
				（人）	(人/日)			
2004	17,732	26,187	32,271	11,204	30.6	8,983	12,084	53.05
2005	91,623	28,245	103,323	16,115	44.2	35,891	51,317	51.56
2006	87,020	70,308	101,354	15,762	43.2	33,282	52,310	81.85
2007	48,508	84,090	82,588	16,548	45.3	20,180	45,860	103.29
2008	56,584	130,062	94,921	19,216	52.5	22,364	53,341	123.01

＊インドネシア運輸省 HP データより

＊BR：Billion Rupiah（10 億ルピア）=約 1 千万円（2010 年 3 月時点）

＊表中の死者、重傷、軽傷の定義は、以下のとおりである。

死者；事故発生 30 日以内に事故に起因する負傷が原因で死亡した場合

重傷；事故後病院での治療が 30 日以上の場合

軽傷；事故後病院での治療が 30 日未満の場合

④交通事故車両

表－９　インドネシアの交通事故に関係した車両

西暦	乗用車	バス	トラック	オートバイ	合計
2004	5,442	1,650	4,872	14,223	26,187
2005	6,095	1,607	4,872	15,671	28,245
2006	10,604	2,945	9,168	47,591	70,308
2007	12,726	3,278	11,006	57,080	84,090
2008	16,552	3,973	14,328	95,209	130,062

＊インドネシア運輸省 HP データより

５．研究ニーズの整理

５－１．研究ニーズのとりまとめ

インドネシア側の実務担当者と国総研の実務担当者により共同ワークショップを開催する前に事前の打ち合わせを行なっており、その際インドネシア側から優先順位の高い研究ニーズとして以下の３つが選定された。

①道路のためのアセットマネージメント技術

②各地域における最適な道のための柔軟な技術規格

（インドネシアでは国土が広大で、諸条件の違いが大きいため、画一的な基準では各地域に最適な道路は建設できない。）

③道路に関する自然災害に対する防災と減災

（インドネシアでは、気候・地形・地質条件により地すべり災害の危険性が高い。）

なお、選定されなかった項目は以下のとおりである。

④道路管理のための、実際の新しい公共管理手法

⑤有料道路と交通情報の分野の新しいサービス。

⑥道路建設と関連した調達におけるコスト削減方法。

⑦道路ネットワークにおける広域的な警報体制への挑戦。

⑧町の快適さを向上するための道路計画。

選定された項目が、アンケートの項目と必ずしも対になっているわけではないが、概ね以下のアンケート項目で参加者に研究ニーズを聞いていると考えられる。

①「維持補修と関連した問題」と「舗装の施工と維持補修（高機能舗装を含む）」の合計
（両方を選択した場合人は１人とカウント）　３人（5 位／12 件）

②「道路と橋（耐震補強技術を含む）の建設技術」　４人（3 位／12 件）

③「災害のマネージメント」　２人（9 位／12 件）

一方、２に示すように、アンケートで最も多くの方に選択された項目は、7 人に選択された「道路の安全性」であった。アンケートの意見からは、交通事故、特に人と車両の事故を課題と見ていると推測される。４に示すように最近のインドネシアの交通事故についての調査結果では、特に近年死者数が増加している。日本とインドネシアの交通事故に関する比較を表－１０に示す。事故件数では、日本の方が多いが、死者数ではインドネシアのほうが多い。

表－１０　日本とインドネシアの交通事故の比較

国（対象年）	事故数（件）	死者数（人）	重傷（人）	軽傷（人）
日本(2009)	736,688	4,914	53,690	856,425
インドネシア(2008)	56,584	19,216	22,364	53,341

出典：日本のデータは警視庁 HP より

日本の死者、重傷、軽傷について

死者：交通事故発生から 24 時間以内に死亡した人数（別途 30 日死者も統計を取っているが通常 24 時間が用いられる。）

. 重傷者：交通事故によって負傷し、1 ヶ月（30 日）以上の治療を要する場合。

軽傷者：交通事故によって負傷し、1 ヶ月（30 日）未満の治療を要する場合。

ただし、インドネシアの交通事故の数字については、公表元のインドネシア運輸省より、「交通事故の過少報告の場合」と題して、

- 警察による報告がない場合に、様々な管轄権（管轄外であること）が大きな一因となっている。
- 警察は報告された場合だけを記録する。
- 保険会社は被害者が請求を申し立てた時のみ記録する。
- 病院は DUA(到着後すぐに死亡)犠牲者も記録しないし、治療を受けた後死亡した犠牲者も記録しない。

過少報告を避けるために、私たちは Road Safety Information System（道路安全情報システム）を Indonesia Police（インドネシア警察）、Ministry of Transportation（運輸省）、Ministry of Public Works（公共事業省）、Ministry of Health（保健省）、そして調整者としての National Planning Board（国家計画委員会）と共に確立しようとしている。

という資料を公表している。

また、両国では、人口、車両の保有台数等、その他にも違いが有り、表－１０をそのまま比較することはできないが、インドネシアでは最低でも 2 万人近い交通事故死者数があることから、社会問題として認識されているものと推測される。

以上より、事前の打合せでは、比較的道路管理者的な視点が強く反映されて研究ニーズが選定されていたが、アンケート結果は、道路利用者に近い視点からの研究ニーズが選定されたのではないかと推測される。

５－２．研究ニーズ

研究ニーズについては、共同研究のニーズを把握することが目的であるため、せん別することなく、幅広く全ての意見を列挙した。

（1）舗装

1）舗装管理システム（メンテナンス用資材とモニターの方法を含む）
2）現場リサイクル法などの最新技術や、高いわだち割れ抵抗（例えばStone Mastic Asphalt）、低騒音舗装や透水性舗装。
3）Asbuton（ブトン天然アスファルト）に関する技術開発
4）簡易舗装と低交通量道路に関連する技術
5）補修の寿命、過負荷、使用される補修資材に関する研究
6）MCI（メインテナンス管理指数）のインドネシアへの導入
7）各地域における最適な舗装のための柔軟な技術規格

（2）橋梁（耐震関連を含む）

1）緊急に対応、周知できるような地震被害予測
2）道路橋の耐震設計技術
3）道路橋の耐震補強技術
4）地震後の道路橋の耐震性評価
5）地震で被害を受けた道路橋の緊急復旧方法
6）道路橋の崩落防止法
7）長大橋の設計及び建設技術
8）地震断層の影響への対策(スンダ海峡)
9）耐風安定性の試験方法
10）各地域における最適な橋梁のための柔軟な技術規格

（3）ＩＴＳ

1）低コストで、設置が容易で、実現可能性のある地方のITS
2）高速道路の交通管制、モニター技術、ETCの採用
3）渋滞緩和（交通混雑解消）のためのITSシステムの導入

（4）道路の安全性

1）交通安全技術
2）道路標識と利用者の間の管理システムの構築
3）幅が狭い道における通行者の発見技術
4）夜に道を渡る通行者の発見技術
5）インドネシアの道路における事故の最小化の研究

６．まとめ

インドネシア側の協力により、アンケート結果に基づき、回答者が次回のワークショップのテーマにすべきと考えている課題の項目、その具体的な内容を把握した。

また、共同ワークショップ会議中には、インドネシアの公共事業省副大臣(Mr. Hermanto Dardak)の挨拶において長大橋とトンネルの技術について重要性が指摘された。長大橋はアンケート結果にも含まれており、またそれら両技術については、日本は世界有数の技術を有していることから、この分野における研究協力も可能性が高いものと考えられる。

取りまとめた研究ニーズの多くは、日本で既に研究として取り組まれている項目が多いと判断されるが、インドネシアでの適用を考慮すると、日本の既存の技術を改良する必要があるニーズも含まれると考えられ、それらには共同研究が必要と思われる。

調査報告　概要版

インドネシアの政府関係の研究機関における舗装、橋梁、ITS 等、関連分野の研究ニーズを把握するための基礎的調査を行なった。その方法として、「INDONESIA /JAPAN-JOINTWORKSHOP in BANDUNG Held by RDCRB and NILIM/PWRI」においてアンケート調査を実施した。

また、アンケートを行なった会議では、インドネシアの公共事業省副大臣(Mr. Hermanto Dardak)の挨拶において、長大橋とトンネルの技術について重要性が指摘された。これらの技術については日本は世界有数の技術を有していることから、この分野における研究協力も可能性が高いと考えられる。

それらの情報を整理して、以下の研究ニーズを整理した。

（1）舗装

1）舗装管理システム（メンテナンス用資材とモニターの方法を含む）
2）現場リサイクル法などの最新技術や、高いわだち割れ抵抗（例えば Stone Mastic Asphalt）、低騒音舗装や透水性舗装。
3）Asbuton（ブトン天然アスファルト）に関する技術開発
4）簡易舗装と低交通量道路に関連する技術
5）補修の寿命、過負荷、使用される補修資材に関する研究
6）MCI（メインテナンス管理指数）のインドネシアへの導入
7）各地域における最適な舗装のための柔軟な技術規格

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1）緊急に対応、周知できるような地震被害予測
2）道路橋の耐震設計技術
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6）道路橋の崩落防止法
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9）耐風安定性の試験方法
10）各地域における最適な橋梁のための柔軟な技術規格

（3）ＩＴＳ

1）低コストで、設置が容易で、実現可能性のある地方の ITS
2）高速道路の交通管制、モニター技術、ETC の採用
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1）交通安全技術
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3）幅が狭い道における通行者の発見技術
4）夜に道を渡る通行者の発見技術
5）インドネシアの道路における事故の最小化の研究

（5）トンネル
1）トンネルの設計及び建設技術

以上のニーズの多くは、日本で既に研究として取り組まれている項目が多いと判断されるが、インドネシアでの適用を考慮すると、日本の既存の技術を改良する必要があるニーズも含まれると考えられ、それらには共同研究が必要と思われる。

参考資料リスト

A．質問表（英語）

B．回答原文（19 人分）

A．質問表（英語）

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
It would be our pleasure to have your cooperation for this questionnaire in order to promote the collaboration between Indonesia and Japan in the research sphere of Roads and Brides.

1. May we have your overall evaluation on this Workshop by checking charts shown below.

	<Excellent> ◄——► <Not Good>				
(1) General Session	5	4	3	2	1
if you participated in; (2)-1 Technical Session Ⅰ (Pavement and Expressway)	5	4	3	2	1
if you participated in; (2) -2 Technical Session Ⅱ (Disaster and Bridges)	5	4	3	2	1
if you participated in; (2)-3 Technical SessionⅢ (Traffic and Technology)	5	4	3	2	1
(3) Discussion of each of (2)	5	4	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

（Ex. New Materials of Pavement proposed from Japan side etc.）

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ?
When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Regulation ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
☐Maintenance and related issues ☐ITS (Intelligent Transport Systems) technology.
☐Execution and maintenance of the pavement (including high-performance pavement)
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☐Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: **Disaster Management**
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name :
Organization :
E-mail address :

Thank you for your cooperation!

B. 回答原文（19 人分）

①

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
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(1) General Session	5	4	(3)	2	1
if you participated in; (2)-1 Technical Session I (Pavement and Expressway)	5	(4)	3	2	1
if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	5	4	3	2	1
if you participated in; (2)-3 Technical Session III (Traffic and Technology)	5	4	3	2	1
(3) Discussion of each of (2)	(5)	4	3	2	1

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(Ex. New Materials of Pavement proposed from Japan side etc.)

Sepang ada Rumus MCI, bagaimana dg. kita apa bisa kita adop dari sepang standar² mereka dan bgm bisa kita dapatkan. apa bisa di down load di internet misalnya.

* MCI = Maintenance Control Index.

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Selected Topic: PLANNING & APPLICATION
Content : Penelitian thg umur rencana & overload & Jenis material yg digunakan .

Selected Topic: PROJECT MANAGEMENT
Content : Penelitian thg proyek di daerah yg berbeda di tinjau dari berbagai aspek / Faktor keberhasilan Quality hasil proyek.

4. Your voice and comments for this joint workshop.

SANGAT SENANG DAPAT MENERIMA INFO BARU TENTANG - PERKERASAN JALAN & PERKEMBANGAN TEKNOLOGI SIPIL & KITA DOAK TERLALU KETINGGALAN .

Your Name : SOERYADI
Organization : PU Aceh
E-mail address : soeryadi_bty@yahoo.co.id

Thank you for your cooperation!

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
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(Ex. New Materials of Pavement proposed from Japan side etc.)

About Structral Health Monitoring System for Bridge and, Smart Structures for Traffic System in Indonesia. (but how about implementation?)

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Selected Topic:
Content : Planning & Programing Transportation System
About development method of Planning Program for System Transportation about status Province and National Road.

Selected Topic:
Content : Public Transport.
Much challenge for public domain (regulator, operator and user) for give the best service for people, how to manage?

4. Your voice and comments for this joint workshop.

Please, in the next joint-Workshop all material presentation in this workshop will be the copy from CD/flash for participant
the participant will be a service, the best
so we care and want to join again with this workshop. The invitation, why not to aim for all sector in Indonesia?

Your Name : Anikani mulya lestari
Organization : dinas bmtr poov. banten
E-mail address : dunharimulyalestari@yahoo.com

Thank you for your cooperation!

③

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Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name : SAFRIZAL

Organization : P2TJ NAD

E-mail address : safrijal77@yahoo.co.id

Thank you for your cooperation!

④

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
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2. What kind of issues and topics did you get your strongest interest in this workshop?
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(Ex. New Materials of Pavement proposed from Japan side etc.)

* Workshop yang bagus. Sip. Namun ada Gatenya bila di buat integratif gitu karena NILIM kan mencakup banyak aspek. Bila semua pusat Litbang diberikan kesempatan presentasi pasti bagus.
* Banyaknya peserta juga perlu dipertimbangkan mengingat ruangan kurang banyak waktu terbuang untuk antri, akibatnya org2 bosan & menghilang pasca coffee break

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Selected Topic:
Content : ITS
~~As the result~~ Traffic jam or future problem facing by Road development body to reduce and manage. We need a new approach with technology to manage the situation and offcourse more of user approach too.

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

It is excellent way to improve & share problem & approach manage by each part & and to find new approach to reduce lost costs by

Your Name : Christanto Yudha Saputra
Organization : Research Institute for Human Settlements
E-mail address : christanto_yudha@yahoo.com

Thank you for your cooperation!

⑤

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Traffic and Technology

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Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name :

Organization :

E-mail address :

Thank you for your cooperation!

6

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
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2. What kind of issues and topics did you get your strongest interest in this workshop?
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Traffic & Technology

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ?
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☐Disaster Management ☑Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
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Selected Topic: Safety in Road
Content :

Selected Topic: ITS
Content :

4. Your voice and comments for this joint workshop.

Your Name : VERA

Organization : RD CRB

E-mail address : vg_sanoe@yahoo.com

Thank you for your cooperation!

(7)

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
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(3) Discussion of each of (2)	5	(4)	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
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(Ex. New Materials of Pavement proposed from Japan side etc.)

Grass Roots ITS : - driving support system for narrow road
- Safety support system at "stop without safety barriers"

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☐Capacity Building including Civil Engineering Judgment ☑Procurement Systems
☐Disaster Management ☑Safety in Road ☑Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☑Others : urban road

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Good, but please be on time :)

Your Name : Natalia Tanan

Organization : RDCRB

E-mail address : natalia.tanan@gmail.com

Thank you for your cooperation!

⑧

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Intelegent Transportation System.

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[Example]
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Selected Topic: ITS
Content :
Deepen. ITS workshop to know appropriate. ITS to be implemented in Indonesia. regarding to our specific condition and behaviour.

Selected Topic: Environment issues including climate change.
Content :
→ What kind of effort to support environment issues in road project activities? This workshop will present more detail about activities to support environment issues : green road drainage system, etc.

4. Your voice and comments for this joint workshop.

This joint workshop is a good moment to digging our partner experiences in road & bridge as well as to exchange our experience.
I hope this kind of workshop can be held frequently.

Your Name : Handiyana.
Organization : IRE
E-mail address : handi_yn@yahoo.com

Thank you for your cooperation!

⑨

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Strategy on ITS Dev in Indonesia by . Iancar .

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Selected Topic: Safe & comfort in road.
Content : due to the lack of management system between road design & road users (any kind of vehicle including motorcycle).

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name : Budiprasetyo D
Organization : Puslitbang Sebramas
E-mail address : budiprasetyo@pu.go.id

Thank you for your cooperation!

⑩

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☐Execution and maintenance of the pavement (including high performance pavement)
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☐Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name :

Organization :

E-mail address :

Thank you for your cooperation!

⑪

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
It would be our pleasure to have your cooperation for this questionnaire in order to promote the collaboration between Indonesia and Japan in the research sphere of Roads and Bridges.

1. May we have your overall evaluation on this Workshop by checking charts shown below.

	<Excellent> ⟷ <Not Good>				
(1) General Session	(5)	4	3	2	1
if you participated in; (2)-1 Technical Session I (Pavement and Expressway)	(5)	4	3	2	1
if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	(5)	4	3	2	1
if you participated in; (2)-3 Technical SessionIII (Traffic and Technology)	(5)	4	3	2	1
(3) Discussion of each of (2)	(5)	4	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

ITC from japan Technology, WIM for checking bridge durability

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
☐Maintenance and related issues ☑ITS (Intelligent Transport Systems) technology
☐Execution and maintenance of the pavement (including high performance pavement)
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☐Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content :
Detection people in narrow road

Selected Topic:
Content :
Detection people who cross the road in the night

4. Your voice and comments for this joint workshop.

It's have a good material but have a difficult in spoken ~~bar~~ accent language and need a translator better

Your Name : DWI BUDI PERMANA, ST
Organization : PUSJATAN
E-mail address : dwibudipermana@gmail.com

Thank you for your cooperation!

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
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1. May we have your overall evaluation on this Workshop by checking charts shown below.

	<Excellent> ⟷ <Not Good>				
(1) General Session	5	(4)	3	2	1
if you participated in; (2)-1 Technical Session I (Pavement and Expressway)	5	(4)	3	2	1
if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	5	(4)	3	2	1
if you participated in; (2)-3 Technical Session III (Traffic and Technology)	5	(4)	3	2	1
(3) Discussion of each of (2)	5	(4)	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

ITS & Smart Structure.

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ?
When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
☐Maintenance and related issues ☐ITS (Intelligent Transport Systems) technology.
☐Execution and maintenance of the pavement (including high-performance pavement)
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☑Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name : Sandi

Organization : Lalulintas

E-mail address : sandi-pras @ yahoo.com

Thank you for your cooperation!

13

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
It would be our pleasure to have your cooperation for this questionnaire in order to promote the collaboration between Indonesia and Japan in the research sphere of Roads and Bridges.

1. May we have your overall evaluation on this Workshop by checking charts shown below.

	<Excellent> ← → <Not Good>				
(1) General Session	5	(4)	3	2	1
if you participated in; (2)-1 Technical Session I (Pavement and Expressway)	5	~~4~~	3	2	1
if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	5	4	3	2	1
if you participated in; (2)-3 Technical Session III (Traffic and Technology)	5	(4)	3	2	1
(3) Discussion of each of (2)	5	(4)	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

ITC Should be pay attention about the Motorcycle behaviour and Road Condition.

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
☐Maintenance and related issues ☐ITS (Intelligent Transport Systems) technology.
☐Execution and maintenance of the pavement (including high-performance pavement)
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☑Safety in Road ☐Environment issues including Climate Change
☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic: Safety in Road
Content : Road Condition can be determine the Safety of driver so it must be well Maintenace.

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Good Workshop

Your Name : Ivan Hermanth
Organization : Pusjatan
E-mail address : haryantohivan@gmail.com

Thank you for your cooperation!

(14)

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
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1. May we have your overall evaluation on this Workshop by checking charts shown below.

	<Excellent> ← → <Not Good>				
(1) General Session	5	4	3	2	1
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if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	5	4	3	2	1
if you participated in; (2)-3 Technical Session III (Traffic and Technology)	5	(4)	3	2	1
(3) Discussion of each of (2)	5	4	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

The topic that presentated by Japan side on traffic & Technology
(ITS & Smart structure)

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☑Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
☐Maintenance and related issues ☐ITS (Intelligent Transport Systems) technology.
☐Execution and maintenance of the pavement (including high-performance pavement)
☐Capacity Building including Civil Engineering Judgment ☐Procurement Systems
☐Disaster Management ☑Safety in Road ☑Environment issues including Climate Change
☑Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

[Example]
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic:
Content :
Make the transportation based on environment aspect

Selected Topic:
Content :
Minimalized the number of accident in Indonesia road

4. Your voice and comments for this joint workshop.

A good reference especially the topic from Japan, we can used that system for transportation system in Indonesia

Your Name : Redi Aditya Y. ST,

Organization : Ministry of Public works

E-mail address :

Thank you for your cooperation!

15

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
It would be our pleasure to have your cooperation for this questionnaire in order to promote the collaboration between Indonesia and Japan in the research sphere of Roads and Bridges.

1. May we have your overall evaluation on this Workshop by checking charts shown below.

	<Excellent> ⟷ <Not Good>				
(1) General Session	5	4	3	2	1
if you participated in; (2)-1 Technical Session I (Pavement and Expressway)	5	✓	3	2	1
if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	5	4	3	2	1
if you participated in; (2)-3 Technical SessionIII (Traffic and Technology)	5	✓	3	2	1
(3) Discussion of each of (2)	5	4	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop? Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

The technology is high tech. But still have a weakness and disadvantages. How about the human recources, it will reduce work field become unimployed. The most important thing is driver attitude in driving

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
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☐Relevance between Economy and Road Projects ☐Others

You can select upper-mentioned items as much as possible. Detailed description on your selected items one by one in the blank below will be highly appreciated.

【Example】
Selected Topic: Disaster Management
Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic: ITS (Intelligent Transport Systems) technology.
Content : We need an advance ITS with human Resources to solve our problem in traffic jam in several location : lots of disadvantages from abad traffic jam. We can start from the systems than the work, work with a good system more longlast.

Selected Topic: Safety in Road
Content : Theres still alots of people died useless, because saftly in road. This need to solve immidiatly

4. Your voice and comments for this joint workshop.

- Very use full, to get a news things in science.
- The next workshop I hope it will be provide with langgue translator, cause not all the participant capable speak & unrawing english well
- The speakers hopefully communicaten in two ways
- Better than nothing

Your Name : Ibumi Mayorrobin
Organization : SMSN VII Denpasar
E-mail address : obin02@yahoo.com

Thank you for your cooperation!

16

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
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if you participated in; (2) -2 Technical Session II (Disaster and Bridges)	5	4	(3)	2	1
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(3) Discussion of each of (2)	5	4	(3)	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop? Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

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Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Your Name : Ir. AGUS HERI PRIYANTO
Organization : DINAS BINA MARGA, PROV. NAD.
E-mail address : STAF TEKNIK

Thank you for your cooperation!

17

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

Thank you very much four your participation in this international joint workshop.
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1. May we have your overall evaluation on this Workshop by checking charts shown below.

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(1) General Session	(5)	4	3	2	1
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(3) Discussion of each of (2)	(5)	4	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

Between each presentation should be time (5 minute) to let the participant to move from one room to other.

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
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Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Should has break (± 5 minute) between each presentation to let participant move from one room to other room

Your Name : Alexis Monteiro

Organization : PT Jasa Marga

E-mail address :

Thank you for your cooperation!

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

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if you participated in; (2)-3 Technical Session III (Traffic and Technology)	5	4	3	2	1
(3) Discussion of each of (2)	5	(4)	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop?
Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

Pavement Strategy in Japan by Mr. Kubo, MSc

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

☐Planning of Act and Registration ☐Investment and Prioritization including Evaluation
☐Construction Technology for Road and Bridge (including earthquake resistant construction technology).
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Selected Topic:
Content :

Selected Topic:
Content :

4. Your voice and comments for this joint workshop.

Cukup baik.
Disarankan agar rencana presentasi diskusun sedemikian rupa sehingga lebih pendek/mencukik setiap topik.

Your Name : SOEDARMANTO D

Organization : TIM TEKNIS

E-mail address : —

Thank you for your cooperation!

INDONESIA/JAPAN-JOINTWORKSHOP in BANDUNG
Held by RDCRB and NILIM/PWRI

<Questionnaire to Participants>

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	<Excellent> ←				→ <Not Good>
(1) General Session	(5)	4	3	2	1
if you participated in; (2)-1 Technical Session I (Pavement and Expressway)	5	4	3	2	1
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if you participated in; (2)-3 Technical SessionIII (Traffic and Technology)	5	4	3	2	1
(3) Discussion of each of (2)	(5)	4	3	2	1

2. What kind of issues and topics did you get your strongest interest in this workshop? Please write down specifically in the blank bellow.

(Ex. New Materials of Pavement proposed from Japan side etc.)

Multiple Fail-safe system effectiveness of unseating prevention that was verified in Earthquake (2003)

3. What sort of theme and issue would you like to cover in the next JOINT-WORKSHOPs ? When you hit upon some ideas, please check on the blanks(☑) shown below. And, could you write down specific contents as much as possible.

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☑Construction Technology for Road and Bridge (including earthquake resistant construction technology).
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【Example】
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Content : Due to the lack of information communication system between road users & road administration bodies especially in the mountain areas, in the east JAWA area, normally, it takes 3 days for initiation of road recovery works at site. It leads to great loss for regional economy and social activities etc.

Selected Topic: Construction Technology for Road & Bridge
Content : • Long span bridge design & construction techniques & the influence of faulting on the earthquake Resistancy (Sunda Strait) & • Testing methods for aerodynamic stability.

Selected Topic: Maintenance & Related issues
Content : Restoration programs for post disaster Repair in quick efficient Remedial operation. to Rehabilitation of the Road-bridge network after Earthquake.

4. Your voice and comments for this joint workshop.

This workshop brings new ideas & innovations for Research in future & applied technology

Your Name : Lanneke Tristanto Ms.
Organization : RDC RB
E-mail address : lannketristanto@gmail.com

Thank you for your cooperation!