Pak-US Joint Research Project

NUST
Defining futures

NATIONAL INSTITUTE OF TRANSPORTATION (NIT)

SCHOOL OF CIVIL & ENVIRONMENTAL ENGINEERING (SCEE)

Joint Venture

MICHIGAN STATE UNIVERSITY

MICHIGAN STATE UNIVERSITY
Civil and Environmental Engineering

Development of Guidelines for Asphalt Pavement Recycling in Pakistan

Research Team

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NUST

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Project Duration/ Budget

- Project Duration : 4 years
  - Jan 2006 To Dec 2009

- Project Budget : US$ 0.85 million
  - NUST Share — US$ 0.50 million
  - MSU Share — US$ 0.35 million

Sequence

- Background
- Reclaimed Asphalt Pavement (RAP) Technology
- Research Objectives
- Research Products/ Outcomes

Background

- An Efficient Transportation System is of Vital Importance for the Socioeconomic Development of Pakistan
- "RECYCLING", a Concept of Roadway Recovery

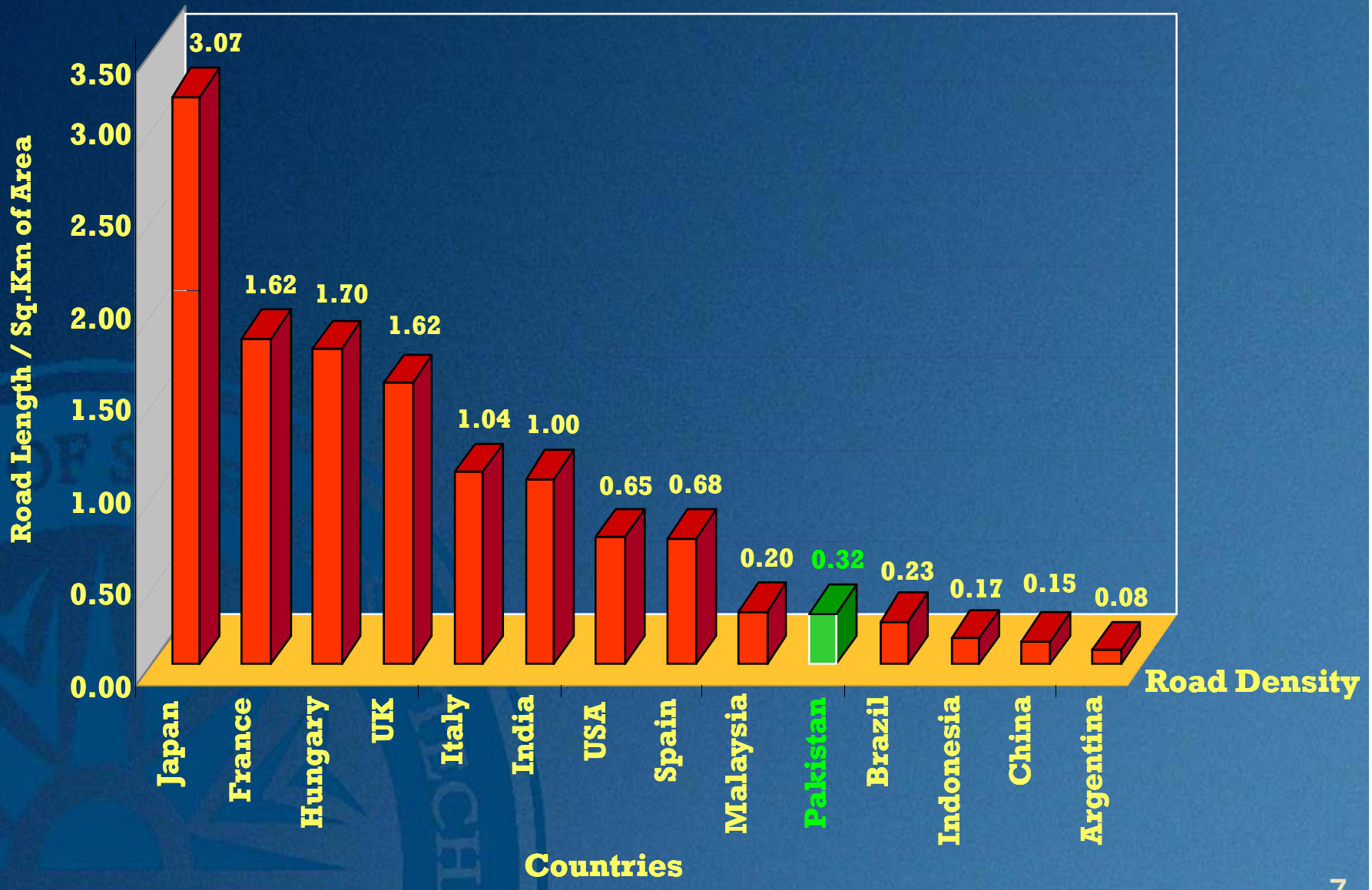
  "The Re-Use of Existing Roadway Materials in the Reconstruction and/or Rehabilitation of Pavements"

- Recycling is a Cost Effective Alternative Provided the Pavement Completes its Design Life

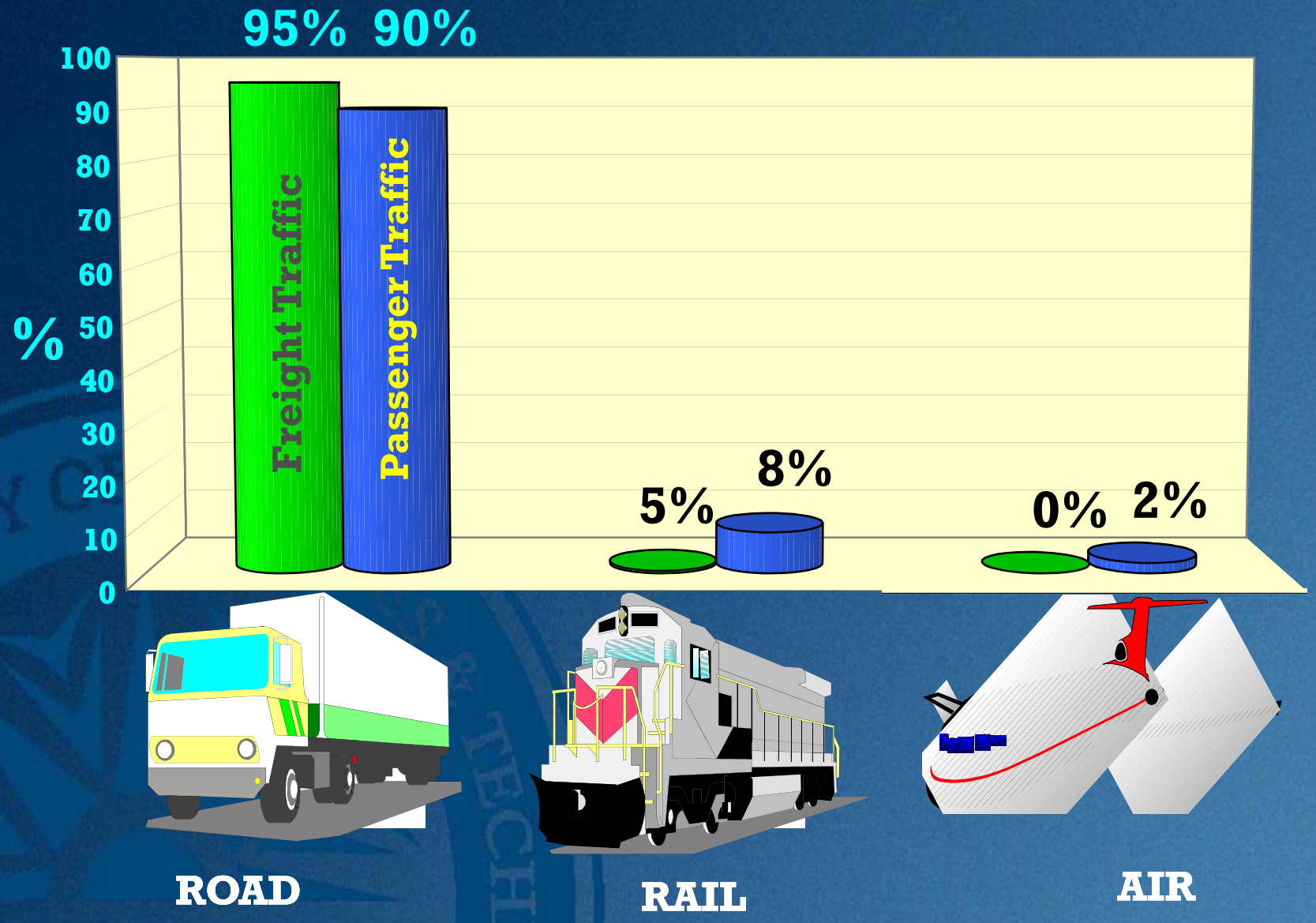
Road Transport Data - Pakistan

Total Roads	260,000 Km
Regd Vehicles	7,000,000
Motorways	679.5 Km
Highways	11321 Km
Density	0.32 Km/Km²

Road Density Comparison



Reliance on Road Network - Pakistan



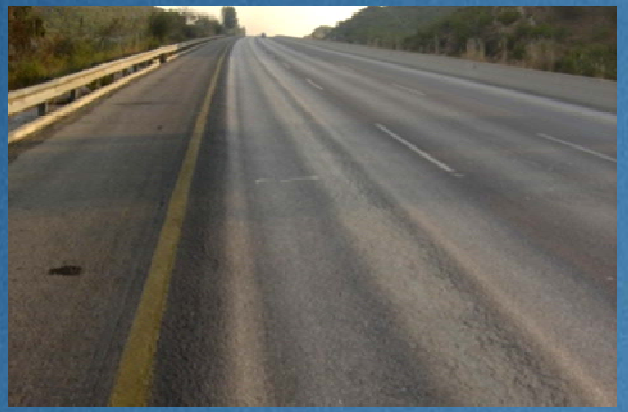
Background

- Road Network is Experiencing High Rate of Deterioration due to Premature Rutting and Fatigue Cracking of the Asphalt-Bound Layers
- Highway Condition is Adversely Affecting the Ride Quality, Traffic Flow, Road Safety and Users Cost
- Why….

Overloading / Temperature

THE CAUSE…

THE EFFECT…



RESULT….

DEPLETION OF NATURAL RESOURCES….

Background

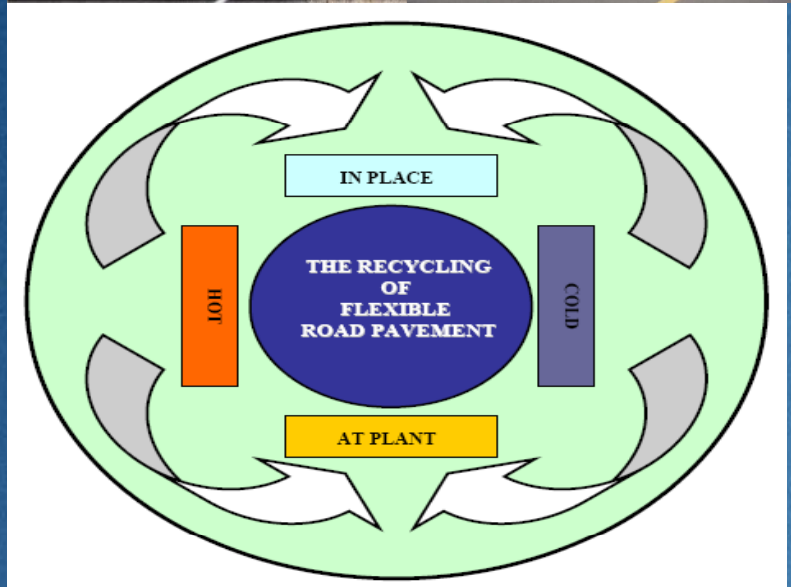
- Restoration of the Road Network Conditions to an Acceptable Level Requires Annual Expenditures of over 10 Billion PKR
- Such Costs could be Decreased if a Comprehensive Pavement Preservation Program is Developed and Implemented
- Pavement Recycling is Cost-effective Preservation Alternative and it Stretches the Available Budget to Maintain More Roads in Good Condition

Background

- Pakistan is Adopting State-of-the-art Reclaimed Asphalt Pavement (RAP) Technology
- Guidelines were Required to be Developed for Evaluation, Design, Material Characterization and Construction Specifications for RAP Application

Asphalt Recycling Methods

- Hot Recycling
  - Hot In-Place Recycling (HIR)
    - Resurfacing
    - Remixing
    - Repaving
  - Hot Central Plant Recycling
- Cold Recycling (CR)
  - Cold In-Place Recycling (CIR)
  - Cold Central Plant Recycling



Benefits of Asphalt Recycling

- Reuse and Conservation of Non-renewable Natural Resources
- Preservation of the Environment
- Energy Conservation and Shorter Construction Periods
- Cost Savings **(30%-50%)** over Traditional Rehabilitation Methods
- Preservation of Existing Roadway Geometry and Clearances

Project Objectives

- To Develop Guidelines, Specifications and Quality Control/Quality Assurance Procedures for Recycled Asphalt Mix Design and Asphalt Pavement Recycling in Pakistan
- To Establish a Protocol for the Selection of Recycling Options for Asphalt Pavements
- Identification of Appropriate Equipment for Construction of RAP and Transfer of Technology

Research Products / Outcomes

Highway Sector

- Developed Guidelines, Specifications and Quality Control / Quality Assurance Procedures for Recycled Asphalt Mix Design and Asphalt Pavement Recycling in Pakistan
- Facilitated Transfer of Performance Based HMA Technology to Pakistan
- Improved Capacity of the Highway Agencies and Construction Industry to Produce Better Roads

Research Products / Outcomes

R&D Institutions

- Improved Quality of Education and Research
- Improved Capacity of Pakistani HEI to Develop Indigenous Design Procedures and Specifications to Support the Highway Industry in Pakistan

Research Outcomes

- Project Reports: 4
- MS / PhD Thesis : 6
- Journal/ Conference Papers : 12
- Training at National Center of Asphalt Technology (NCAT), Auburn University, Alabama
- International Workshops : 2


Thank You!