PIARC Global Road Safety Knowledge Exchange

Data

Summary

- About PIARC
- Why Collect Data?
- Data Types and Collection Methods
- Data Collection Methods Opportunities and Challenges
- Collection Recommendations

About PIARC

PIARC

World Road Association

- Founded in **1909** as a non-profit, non-political Association
- Foster and facilitate global discussion and **knowledge sharing on roads and road transport**
- **124 government members** worldwide
- Retains **consultative status** to the Economic and Social Council of the **United Nations**
- **4 Strategic themes**: ST1 road administration, ST2 mobility, ST3 safety and sustainability, ST4 resilient infrastructure
- **16 Technical Committees** (TCs), 4 per strategic theme, unite experts from numerous areas including road safety and design, network operations and maintenance, finance and governance.

PIARC Road Safety Technical Committee

Technical Committee T.C. 3.1: Road Safety part of ST3:

- Observes specific **road safety issues for LMICs**
- Explores the implementation of **proven countermeasures**
- Updates the "**Road Safety Audit Guidelines**" and the "**Road Safety Manual**"
- Disseminates and encourages the **application of the manuals**
- Provides **access to well-chosen safety measures** and their dissemination among **LMICs**
- Studies the implications of **connected and automated vehicles**

PIARC Road Safety Activities

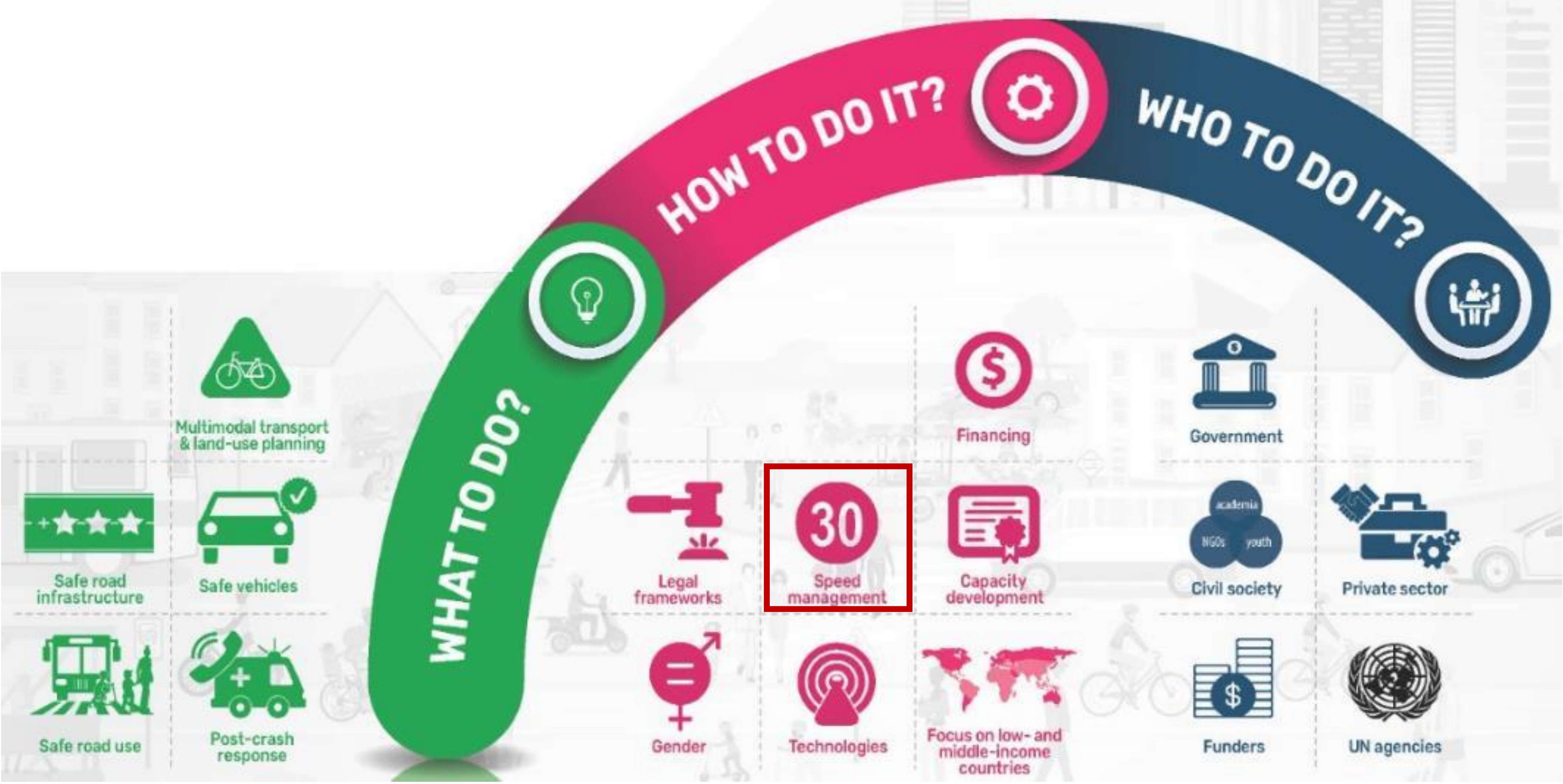
- **Technical reports** prepared by the Technical Committees
  - Well-Prepared Projects
  - Automated Vehicles – Challenges and Opportunities for Road Operators and Road Authorities
- **Road Safety Manual**: an electronic manual for all technicians and managers concerned about road safety issues **acknowledged by the United Nations**
- **Seminars** organised by the Association available online
  - Connected and Autonomous Vehicles, a Pathway towards a Safer Future, 27-28 October 2021
  - Road Safety in Low to Middle Income Countries, 18-20 May 2021
- Declaration of **Support** to the **UN Decade of Action**

PIARC Global Road Safety Knowledge Exchange Project

- Aiming to **promote knowledge sharing** through appropriate implementation aids that will reflect previous work of but not limited to PIARC
- Focus on spreading road safety knowledge to **Low- and Middle-Income Countries,** where **death rates** due to road traffic injuries in LMICs are **three times higher** than in high-income countries (HIC).
- With the support of National Technical University of Athens (**NTUA**) and Austrian Institute of Technology (**AIT**)
- Deliverables for this project include **fact sheets, presentations**. Based on the road safety manual and other relevant **material produced by PIARC** technical committees (reports, case studies etc.).

Why collect data?

UN Decade of Action for Road Safety



Safe System Approach

- **UN Second Decade of Action for Road Safety**, with a goal of reducing road traffic deaths and injuries by at least 50 per cent from 2021 to 2030
- Adoption of Safe System Approach is necessary to **prevent fatal and serious crashes**.
- **Data collection and analysis** can facilitate the maintenance and **management of the road network** and provide stress-free journey to road users
- Strengthened data collection methods locally and nationally contribute to **improved evidence-based policies on vulnerable road users.**

Safe System Principles

Death/Serious Injury is Unacceptable

Humans Make Mistakes

Humans Are Vulnerable

Responsibility is Shared

Safety is Proactive

Redundancy is Crucial

Why Collect Data?

- While some road crashes are predictable and thus preventable, **efforts to reduce crashes in developing countries** are further **hampered by lack of accurate crash and casualty data.**
- **LMICs road administrations** struggle to successfully adopt efficient ways to manage their assets due to **limited resources**.
- **Data collection** helps governments to more **effectively prioritize funding**, monitor the impact of investments, and strengthen inter-agency collaboration and efficiency.
- **Improved access to data** on the effectiveness and costs involved in establishing interventions can lead to **ongoing improvements** and support for their broader application.

Data Types and Collection Methods

Road Condition and Maintenance related Data

Types of Data

- **Inventory data** for road and road assets: Used as benchmark by transport authorities for evaluating and prioritizing road projects
  - Asset management systems and solutions useful if the quality and quantity of asset data are reliable
  - In vehicle automated or semi-automated methods
  - Highway inventory data GPS data collection: logger, robotic total station, electronic distance measuring systems, mobile lidar, combination of video/photo with aerial imagery.

- **Road condition and maintenance** Data

Road Condition and Maintenance Data Collection Methods

- **In-vehicle sensors**: essential components of any vehicle
  - Improve vehicles performance
  - monitor its operation and the status of its parts
  - enhance the driving experience
- **Smart phones**: accelerometers capturing variations in movement caused by the road surface
- **Unmanned Aerial Vehicles** (UAVs) or Systems/drones: popular data collection method for road condition and maintenance management
  - low cost,
  - readily available
  - efficient
  - can reach remote locations therefore safer.
- **Other fixed sensors**: recorded signals/acoustic signature
- **Winter maintenance**: thermal mapping, forecasting models

Traffic Related Data

- **Smart Transportation** is cost-effective and significant component of Smart Cities
- Principal challenge is **Traffic Congestion** due to increase in vehicle numbers and population and a changing balance of transport modes
- The aim is for traffic to **flow smoothly** and to **keep travelers** better **informed**
- **Methods**:
  - Traditional Sensors
  - Smart Sensors: provide real-time traffic information
  - Cameras CCTV systems and GPS signals: data on road occupancy, vehicle speed, accident detection, traffic collision and weather info
  - UAVs

Large-scale data on travelers behaviors

- **People actively participate in the process of recording data** using technologies such as GPS systems, cellular networks, social media services, Automated Fare Collection System, smart cards.
- **Benefits**:
  - Modern traffic management and control strategies
  - Robust vehicle detection system
  - Mining mobility patterns
  - Travel demand analysis,
  - Incident detection
  - Air quality measurement
  - Urban planning
  - Emergency systems

Data from connected and Autonomous Vehicles

- **Embedded electronics** account for more than 30% of the cost of a vehicle, including a multitude of sensors and actuators, various computers, Engine Control Units and internal digital networks of interconnectivity.

- These systems provide:
  - Road Condition Data,
  - Traffic Management data,
  - Safety Data
  - Identification of intersections with high levels of variability in sudden changes in driving behavior prior to the occurrence of crashes

Road Technologies Related Data

- Intelligent Transportation Systems and connected vehicles together with the Internet of Things provide more **efficient and sustainable transportation systems** that minimize the impact on the environment.

- **ITS constraints**:
  - political environment not suitable for data sharing and exchange
  - privacy issues related to data publication and distribution
  - lack of policy and governance to control and regulate information exchange within different operators.

Data generation for and from social media

- People tend to **share traffic information with a large audience** thus traffic control organizations started using social media.
- **Types of data** generated:
  - Traffic forecast and events detection
  - Journey information
- Social media used:
  - **Twitter**: automatic detection of traffic events using Twitter data mining
  - **Facebook**
- Data sourced for social media is **highly unstructured** and is **of massive volume** and therefore requires complex processing methods.

Road safety related data

- **Accident detection data** aim to **timely inform** emergency services about the location of an accident.
- Collection **method**:
  - Sensors
  - Smartphones
  - GPS and GMS
  - Ultrasonic sensors

- **Road safety data** support for **crisis management** in the occurrence of events, accidents and damage and ongoing traffic monitoring. Using data from UAVs.

Disaster management data

- Greater focus is required on the **interaction** of disaster management activities **with the public** to produce better results instead of prioritizing only making infrastructures safe.
- Data Collection Methods for Disaster Management and Disaster Relief:
  - Satellite images
  - Meteorology
  - Cameras
  - Vehicle detection
  - GIS

Data Collection Methods Opportunities and Challenges

Collection Method	Benefits	Challenges
Accelerometers, GPS, microphone, camera in smartphones	• Real-time data collection • Monitor road condition on an ongoing basis • Low-cost	• Reduced detail of information • Focus beyond road inventory • Cover the full range of highway assets.
Drones	• Low cost, readily available and efficient • Reach remote locations	• Integration of information from drone surveys into existing IT infrastructure • Better alignment with wider management of airspace surrounding road infrastructure
Acoustic sensors	• Monitor the effect of traffic on the condition of the road pavement	• Requires skills to understand, analyse and utilize the data
Social media	• Monitor critical real-time information	• Use of approaches such as keyword extraction and machine learning based models • Management and analysis of big data
CAVs	• Increased understanding of road infrastructure, services and the environment.	• Reliability and security of the data flows is critical

Data Quality

The main steps to **improving data quality** include:

- Reviewing of **variable definitions**
- Ensuring definitions are **simple** to understand and apply
- Reinforcing the **need to report data** (e.g. make it a legal requirement)
- **Improving** data **collection tools**
- Collecting **accurate location information**
- Improving **training** of **police** and data entry staff
- Ensuring data collected is accurate and reliable through **quality assurance measures**

Recommendations

Data Recommendations (1/2)

- **Crash data** is important for infrastructure management in **LMICs**, as the collection and analysis of crash data (among Road safety audits and safety inspections) is a widely applied approach to manage infrastructure/assess the risks.
- For LMICs, crash data may not be reliable or available. **Surveys and other data sources** to measure and monitor road safety are needed.
- When crash data is analysed, an **understanding of crash causation factors** needs to be given. A crash is not the result of a single cause – contributing factors to crashes have to be examined to identify the issues.
- When using crash data, it is important to **define the crash locations** and the time period to be looked at (usually 3-5 years, for LMICs a pattern could sometimes be recognized within 1-2 years)

Data Recommendations (2/2)

- Data is a **key factor to evaluate investments**. This is especially important with limited budgets, as effectiveness of road safety measures should be demonstrated and inefficient use of limited funding or an increase of crash risk should be known.

- **Data quality is important**, as e.g. a false low number of casualties will reduce the importance of road safety as a public health issue or misleading information can lead to ineffective decisions being made (e.g., investing the money elsewhere in the road network).

PIARC IS BOOSTING ROAD SAFETY IN LMICs

- PIARC recognizes the **importance of data** collection, analysis and evaluation in order to increase road safety levels and produced, and made available, data related reports, case studies and documents.
- PIARC is engaged in **promoting road safety** all over the world and committed to **actively support safety in LMICs**.
- All actions contribute fully to the success of the **UN Decade of Action for Road Safety**.
- The new knowledge-sharing campaign for road safety will provide **monthly updates**, on social media and on PIARC website, for **all essential road safety areas**.

- **Stay tuned for more actions and events!!**

Relevant PIARC reports

- Road Safety Manual. Road Safety Management. Safety Data
- Road Safety Manual. Planning, Design & Operation. Risks and issue identification
- Road Safety Manual. Planning, Design & Operation. Monitoring and evaluation
- Proceedings of the PIARC International Seminar on: “Road Safety in Low- and Middle-Income Countries: Issues and Countermeasures”
- Proceedings of the World Road Congress 2019
- Addressing Road Safety Worldwide: Vulnerable Road Users, Human Factors & RS in LMIC
- Road related data and how to use it
- Utilizing data to optimize road network operations. A PIARC collection of case studies
- Land use and Safety: An introduction to understanding how land use decisions impact safety of the transportation system

Thank you for your attention!

PIARC

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