



PUNJAB ROAD SECTOR POLICY



The Urban Unit
Urban Sector Planning & Management Services Unit (Pvt.) Ltd.



PUNJAB ROAD
SECTOR
POLICY



Acknowledgement

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Abbreviations

ADP	Annual Development Plan
CPEC	China-Pakistan Economic Corridor
C&W	Communication and Works
DDSC	Departmental Development Sub Committee
HRMS	Human Resource Management System
ICT	Information Communication Technology
IT	Information Technology
ITS	Intelligent Transport Systems
M&E	Monitoring and Evaluation
PRF	Provincial Road Fund
CESAL	Cumulative Equivalent Single Axle Loads
AASHTO	American Association of Highways and Transport Officials
RAMS	Road Asset Management Systems
PSR	Present Serviceability Rating
IRI	International Roughness Index
FHWA	Federal Highway Administration
NHA	National Highway Authority



Foreword

Development and spatial distribution of the Punjab Road network is influenced by two major factors. These are occurrence of natural water channels i.e., rivers and geo-strategic location of Punjab within the South East Asia region. All the natural perennial rivers in the Punjab are located on the Eastern side of the province and flow from North to South and all major cities of Punjab have developed primarily along the water channels. Likewise, the geo-strategic location of Punjab within Pakistan and in the South East Asia region makes it a vital transit node for access to China, Iran, India and Central Asian States.

However, ad-hoc unilateral development of road infrastructure and poor management and planning has led to a fragmented road network imposing high connectivity and freight delivery cost. Natural preference for development along existing water channels and under-investment has primarily resulted in road and rail network development in North-South direction with poor East-West linkages. Eastern and Western part of the province lack high speed linkages; thus resulting in disparity and detriments for cities spatially located in the province. Connecting high potential industrial and agriculture growth corridors and nodes and bringing under developed area at par through fast connections, with rest of the province through an efficient road transport network for multi modal operations will not only provide regional, trans-provincial and international competitiveness but will also help in achieving the targeted development goals.

In addition, CPEC provides an excellent

opportunity to revolutionize and upgrade struggling road and freight transport sector of the Punjab; however, in order to extract benefits from the CPEC, Punjab has to transform these road corridors into freight corridors by linking agriculture and industrial corridors with the dry-ports and developing freight terminals for goods delivery facilitation.

The purpose of the Punjab Road Sector Policy is to promote economic development and social inclusion through an accessible, reliable, safe and well-connected road system that will help alleviate poverty and ensure economic prosperity for all. The Policy outlines the mechanisms, procedures, and priorities to achieve and sustain inclusive growth in Punjab. The Punjab Government intends to develop strategically situated new roads and maintain existing roads in a state of good repair to achieve improved distribution of economic activity and opportunity that has concentrated historically in the eastern parts of the province.

It is with great pleasure and honour that I present the Punjab Road Sector Policy that aims to provide guidelines for provision and upgradation of roads and institutional frameworks necessary for development and maintenance of roads in Punjab. The Policy focuses on the technical, financial, and administrative aspects related to road infrastructure development in Punjab. Further, the Policy addresses the challenges faced by the public institutions in developing and maintaining a road network that acts as a catalyst for economic growth and social progress.

Mohammed Omar Masud



PREAMBLE

Pakistan is at the brink of an economic and social transformation. The socio-economic successes in the past few years have inspired a sense of optimism in the nation. The continuous decline in terrorism-related violence and the concentrated infrastructure investments under the China-Pakistan Economic Corridor (CPEC) have changed the dialogue in and about Pakistan.

Punjab being the bread basket of Pakistan is at the forefront of this socio-economic recovery. Its fertile land and abundant human capital provide the competitive advantage and the impetus for economic growth. The Government of Punjab is implementing Punjab Growth Strategy to increase economic growth to create additional one million jobs every year and increase annual private sector investment in the province to USD \$17.5 Billion (PKR 1839.77 Billion¹).

Given the CPEC related flow of investments, it is incumbent that an enabling infrastructure and efficient governance are in place to act as enablers of growth and shared prosperity. The road network in Punjab is a critical input to generating economic growth, promoting social equity and shared prosperity. The Punjab Road Sector Policy (hereafter 'Policy') outlines the mechanisms, procedures, and priorities to achieve and sustain inclusive growth in Punjab.

The existing road network in Punjab comprises a diverse network of roads running 75,958 km in length . Approximately 39,029 km of the road network is essentially farm to market roads. Provincial highways account for 10,519 km of both single and dual carriage ways. The national highways and motorways under the regulatory control of the National Highway Authority(NHA) comprise 2061 km and 443 km respectively.

The Government of Punjab is acutely aware of the uneven development

landscape across the province resulting in social exclusion of areas where road accessibility is inadequate. The Government is committed to inclusive growth and shared prosperity; thus, ensuring availability of socio-economic opportunities for all. It is for this very reason that the proposed routes for CPEC transverse Punjab through three different alignments enabling a greater integration of districts with the new industrial clusters likely to emerge as part of CPEC-related investments. Furthermore, the multi-modal corridors will provide faster and reliable access for agricultural produce from farms to local and international markets. Thus, arises a dire need to develop east-west linkages to maximize the potential benefits of the CPEC related investments. Yet, challenges related to strategic investment in road sector include weak institutional frameworks, old construction techniques and out dated specifications/ construction manuals/ absence of private capital, inappropriate methods of tolls and charges and lack of Information Communication Technology (ICT) based monitoring and maintenance practice.

The Punjab Government intends to develop strategically situated new roads and maintain existing roads in a state of good repair to achieve improved distribution of economic activity and opportunity that has concentrated historically in the eastern parts of the province.

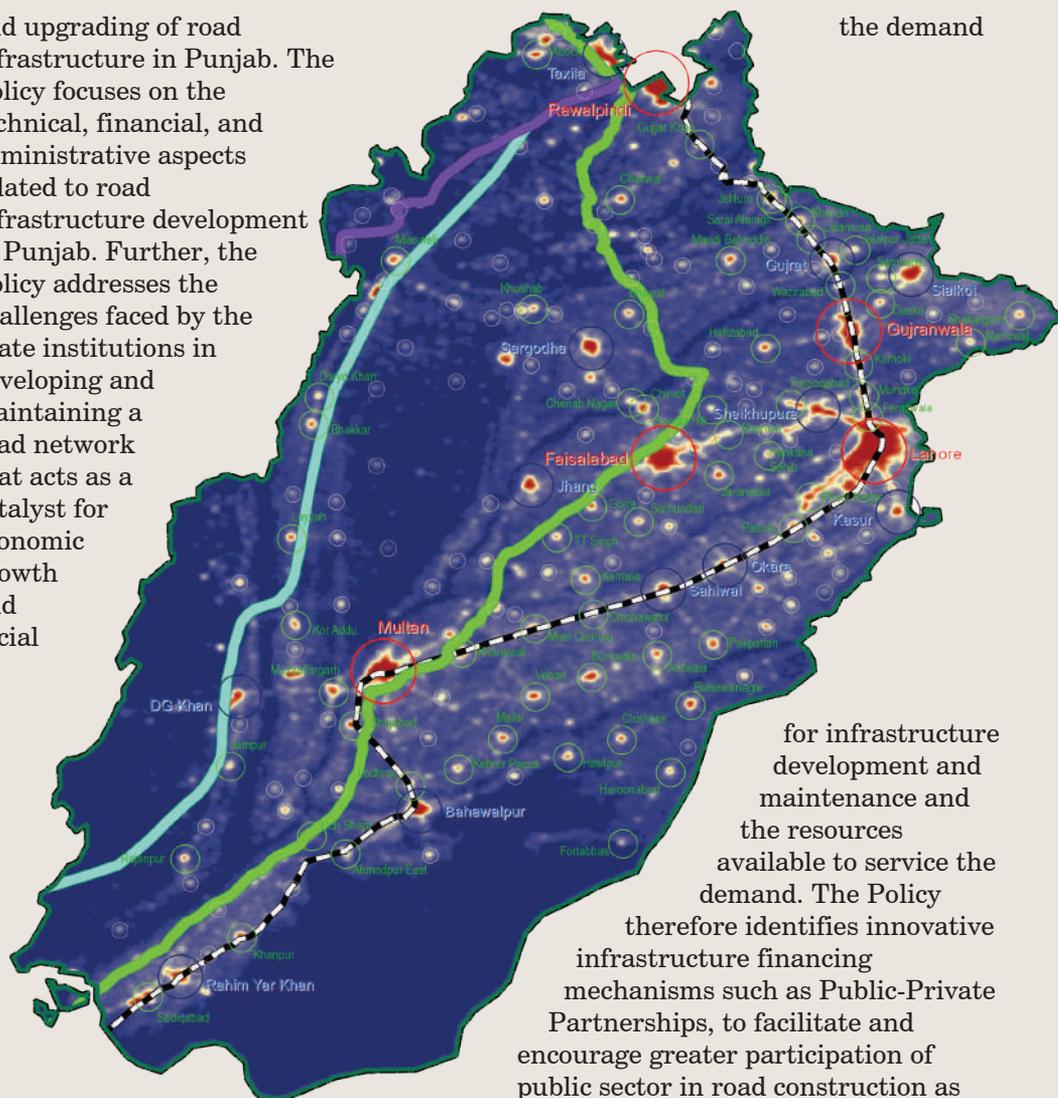
The underlying Punjab Road Sector Policy is devised and maintained by the Communication and Works (C&W) Department of the government of the Punjab. The Department is responsible for the enforcement of the Policy through necessary legal frameworks. The C&W Department will ensure that the Punjab Road Sector Policy is a living document by regularly updating the Policy to meet the emerging needs of people and goods movement.

The Road Sector Policy aims to provide

¹ \$ is equal to PKR 105.13

² Punjab Development Statistics, 2016

and upgrading of road infrastructure in Punjab. The Policy focuses on the technical, financial, and administrative aspects related to road infrastructure development in Punjab. Further, the Policy addresses the challenges faced by the State institutions in developing and maintaining a road network that acts as a catalyst for economic growth and social



the demand

for infrastructure development and maintenance and the resources available to service the demand. The Policy therefore identifies innovative infrastructure financing mechanisms such as Public-Private Partnerships, to facilitate and encourage greater participation of public sector in road construction as well as construction financing and maintenance. The Policy therefore highlights the need for new mechanisms for cost recovery through tolls and road user fees.

progress.

Essentially, the Policy identifies frameworks to prioritize investments in road infrastructure projects that offer the highest rate of return in socio-economic terms. In addition, the Policy sets out technical and engineering specifications related to road infrastructure development and maintenance to facilitate uniformity in standards and procedures.

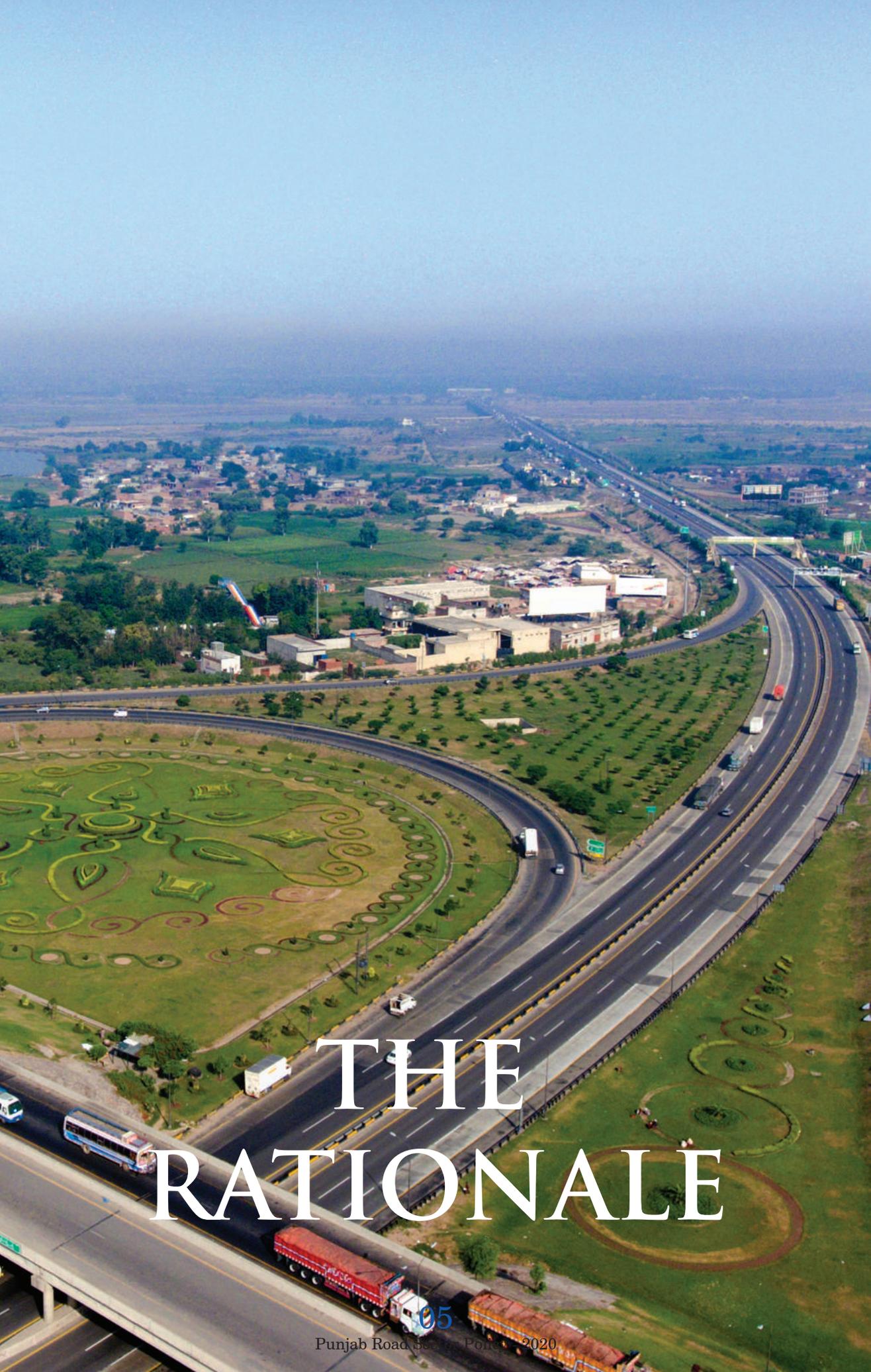
Whereas the Government of Punjab is aggressively pursuing opportunities for infrastructure development and maintenance, the demand for infrastructure, derived from the sustained increase in rapidly growing population, exceeds the own source revenue capacities of the government. Evidently, a large gap exists between

The Policy recognizes that road infrastructure development and maintenance in Punjab do not necessarily embrace the modern construction engineering practices. At the same time, the existing documentation and specifications are antiquated. The Policy therefore identifies strategies to modernize road construction, maintenance, and upgradation in Punjab. At the same time, the Policy's technical appendix documents relevant codes and specifications reflecting the best practices today.

CONSULTATIONS & MEETINGS

Given the scale and scope of activities and processes that relate directly or indirectly with a road sector policy, a consultative process was devised to solicit information, opinions, and guidance from relevant stakeholders and the public and private sectors. The consultative process included day-long facilitated sessions involving academia, practitioners, road users, and senior government functionaries involved in road sector policy making. Separate sessions were held with private sector stakeholders to solicit their feedback.

Concomitantly, the team also held small sized focus groups with key public-sector stakeholders to solicit their views and opinions. A detailed list of stakeholders and participants consulted is available



THE RATIONALE

DEMOGRAPHIC PRESSURE

Whereas the population growth rate in Punjab has subsided over the past few decades, however, the current rate continues to create additional demands for employment, housing, health, education, and other services. At the same time, rapid motorization, primarily driven by a drastic increase in the number of motorized two wheelers, is creating additional demand for mobility and road infrastructure, resulting in the demand far exceeding the capacity of the existing road infrastructure.

Punjab leads the rest of the nation in road density, which currently stands at 0.37 km per square kilometers of land. However, the extent of the current road network and its state is not sufficient to facilitate enhanced economic activity and social interactions of a growing population, which currently stands at approximately 110 million citizens. Whereas an acute need to expand the road infrastructure is recognized, the goal is to develop the network strategically to obtain the highest rate of return in economic and social terms.

PRIORITIZING NEW ROAD CONSTRUCTION OVER MAINTENANCE

Often, new road construction is prioritized over maintenance of existing infrastructure, which results in appropriation of funds primarily for new road infrastructure development. This creates a scarcity of funds for the maintenance of existing road infrastructure. If such trends were to continue, the existing infrastructure will result in continuous deterioration in the structural integrity of existing road infrastructure.

There is a dire need of a Policy that recognizes the necessity to maintain existing road sector assets and the allocation of adequate funds to keep the existing road infrastructure in a state of good repair.

AD HOC DECISION-MAKING

The decision-making processes currently in place do not necessarily guarantee that the road infrastructure is being expanded to create a strategic network. Stakeholder consultation revealed that the selection of new road development and construction is based on ad hoc decision-making rather than being a result of strategic multi-objective evaluation, which also includes an adequate cost-benefit analysis.

A road sector policy is needed to put in place formal decision-making processes based on scientific principles and global best practices to replace ad hoc decision-making. The Policy is also needed to provide a formal framework for road infrastructure development and maintenance in a diverse province comprising megacities, small towns, villages, and informal settlements.

WEAK EAST-WEST CONNECTIVITY

A related structural deficiency of the road infrastructure is a lack of east west connectivity in Punjab. Existing north-south orientation of road infrastructure creates linear bi-directional linkages resulting in excessive journey time, fuel usage and travel cost. Consequently, a policy is required which sets the direction of the future developments into a reliable and efficient road infrastructure that links the economically developed eastern part of the province with the struggling South-central/Western part.

INADEQUATE CONNECTIVITY FOR SPECIAL ECONOMIC ZONES

Equally relevant is the need to connect the existing special economic zones with the markets using a reliable and efficient road infrastructure. The absence of a policy is resulting in limiting the potential of the existing economic zones and the ones to be developed under CPEC. Thus, there is a need for policy that defines a well-developed strategic road network linking clusters of economic productivity with large urban markets, dry ports, and seaports in Karachi and Gwadar and unlocking the potential for economic growth.

DETERIORATING ROAD SAFETY

Road accidents continue to claim a huge toll on life and property in Pakistan. In 2011 alone, 8400 individuals lost their lives in roadside accidents. If one were to normalize the number of fatalities by the vehicle kilometers travelled in

Pakistan, the resulting fatality rate is one of the highest in the world. Therefore, the need to improve safety features of existing road infrastructure by reengineering and incorporating road safety as a fundamental tenet in the design of new roads is acutely felt in Punjab. This can be achieved by considering road safety as a pillar of a comprehensive Policy.

INADEQUATE FUNDING MECHANISMS AND PROCEDURES

The existing public sector financial practices are such that sufficient funds to support road infrastructure construction, maintenance, and upgradation are not released timely for multiyear projects. This results in “Throw Forward”. The antiquated financial governance regimes in Punjab need to be overhauled and replaced with the state-of-the-art in financial regulation and infrastructure finance. There is a need for a comprehensive policy that identifies the framework for funds allocation for existing roads maintenance and upgrading, and



HUMAN CAPITAL NEEDS FOR ROAD SECTOR PLANNING

Road infrastructure construction, maintenance, and upgradation have primarily been the responsibility of the C&W Department. However, development of sufficient human capital able to deliver on department's mandate of road construction, maintenance, and upgradation as per best engineering practices is yet to be realized.

The Department is fortunate to have exceptional human capital in highway engineering. However, other expertise in matters related to infrastructure finance, information technology for smart infrastructure monitoring and asset management, development economists to produce comprehensive multi-objective evaluations of competing infrastructure development alternatives, and social scientists is missing. Expertise and infrastructure are also missing to support big data storage and analytic capabilities for smart infrastructure monitoring. The need to build additional capacity at the C&W Department is therefore acute and a policy depicting existing and future human capital needs as per the vision of the department is warranted.

MONITORING AND EVALUATION OF ROAD INFRASTRUCTURE

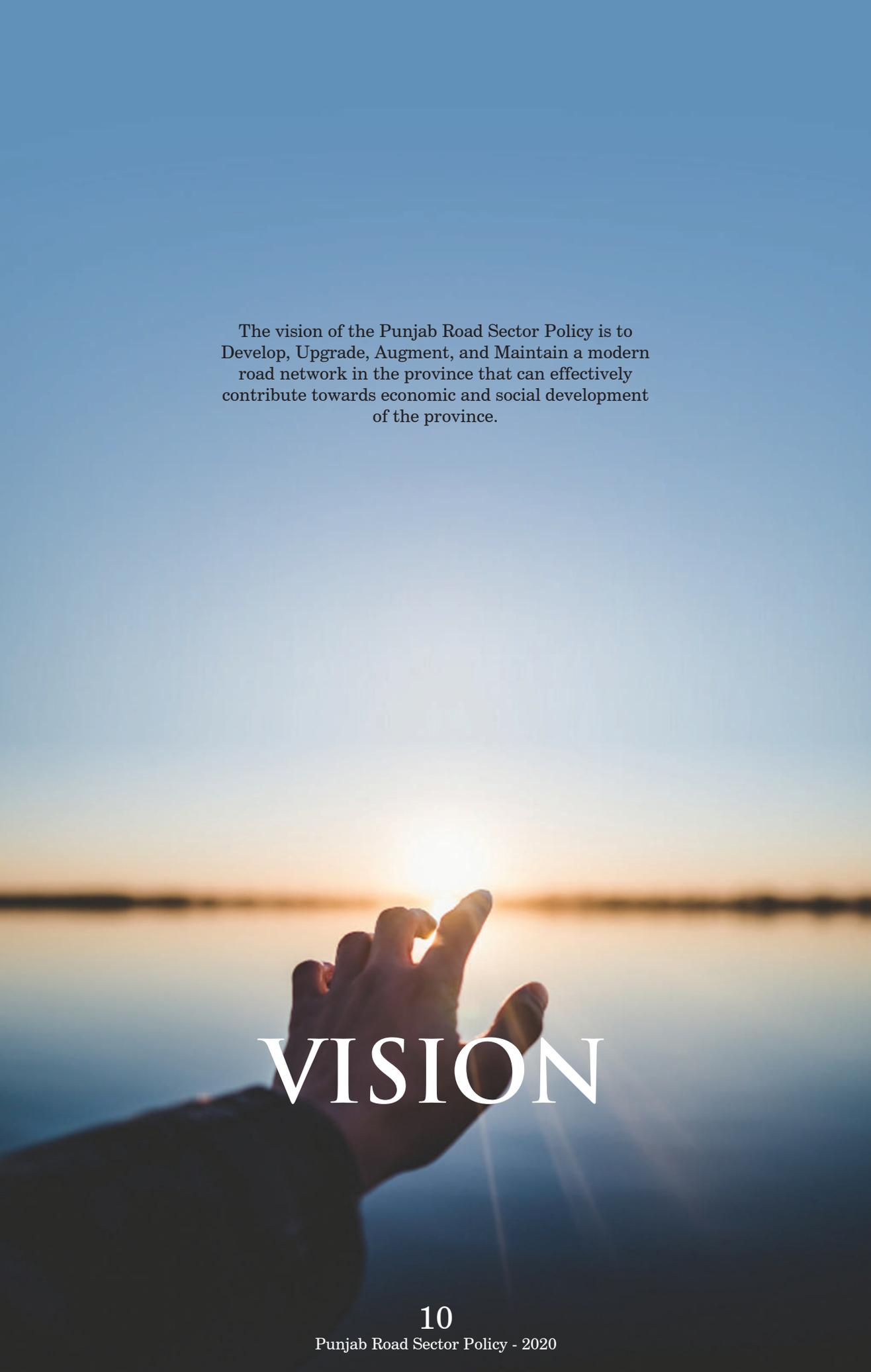
A core function of the C&W Department is to hire the services of the contractor for the construction of roads and bridges in the province. Therefore, effective Monitoring and Evaluation (M&E) of road sector projects is required. Given the stated preference for greater transparency by the Government of Punjab in all development works, deployment of M&E tools within road sector will help strengthen project design, application of construction standards, progress review and



The purpose of the Punjab Road Sector Policy is to promote Economic Development & Social Inclusion through an Accessible, Reliable, Safe and Well-Connected Road System that will help alleviate poverty and ensure economic prosperity for all.



PURPOSE

A hand is shown in silhouette, reaching upwards towards a bright sun on the horizon. The sun is partially obscured by the fingers, creating a lens flare effect. The background is a calm body of water reflecting the sky, which transitions from a deep blue at the top to a warm orange and yellow near the horizon. The overall mood is one of aspiration and vision.

The vision of the Punjab Road Sector Policy is to Develop, Upgrade, Augment, and Maintain a modern road network in the province that can effectively contribute towards economic and social development of the province.

VISION



OBJECTIVES

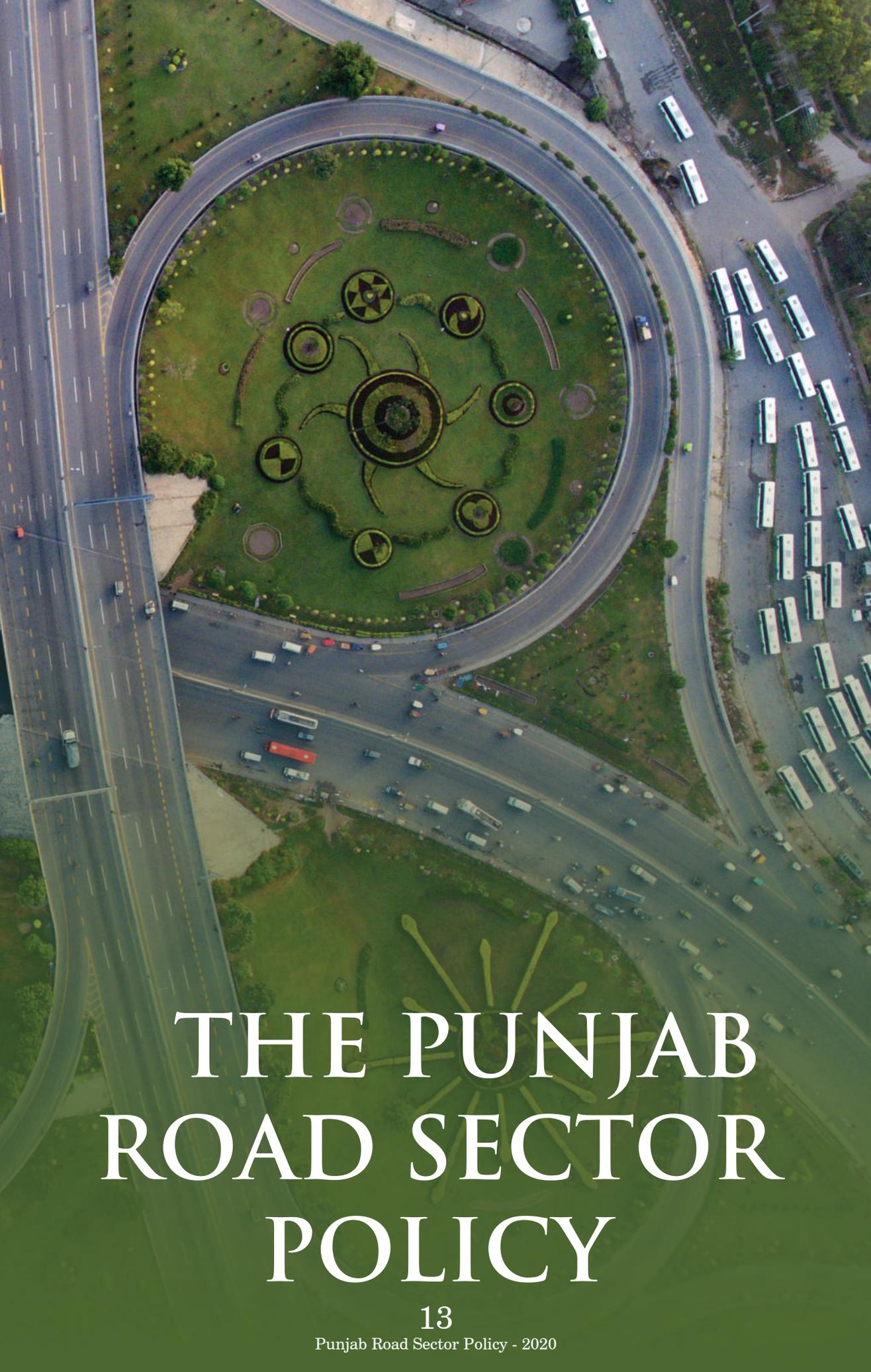
The objectives of the Policy are to

- ❖ Promote sustainable road infrastructure that can support the mobility of people and goods resulting in higher economic growth rate
- ❖ Increase in Road Density to 4 in 5 years
- ❖ Develop new Economic Corridors
- ❖ Improve and promote good public transport connections through improvement of existing corridors resulting in better mobility for all
- ❖ Promote road safety resulting in fewer fatal and serious injuries in the province
- ❖ Reduce regional disparities and create shared prosperity through improved accessibility
- ❖ Improve social inclusion by providing marginalized communities better and efficient access to markets and opportunities
- ❖ Improve health of citizens by providing faster and reliable access to healthcare facilities
- ❖ Promote quality and efficiency of freight transportation network
- ❖ Ensure the availability of an adequately trained workforce
- ❖ Promote increasing use of modern technology and research in road transport development
- ❖ Provide and strengthen data collection and management systems to assist in continued policy and performance evaluation
- ❖ Improve east-west connectivity in the province
- ❖ Enhance human capital in governance above and beyond engineering
- ❖ Enhance value for money by including socio-economic perspectives to infrastructure development and maintenance

OUTCOME

The Policy will unlock the potential of the under-developed areas by providing better access, especially to rural areas, while promoting inclusive growth by linking economic and service sectors. Furthermore, the policy provides functional and structural classifications for better asset management. Correspondingly, the policy proposes a road infrastructure score card to help decision makers select and prioritize road projects based on objective and tangible parameters. Moreover, the policy covers components such as maintenance, operations, safety, traffic management, financing and use of ICT's for efficient utilization of resources in the development and maintenance of road infrastructure.

(Detailed information is outlined in the accompanying detailed technical appendix B).



THE PUNJAB ROAD SECTOR POLICY

SCOPE OF RESPONSIBILITIES

The Punjab Road Sector Policy covers all aspects of road construction, maintenance, and upgradation of road infrastructure including, but not limited to bridges, tunnels, and underpasses. The Policy recognizes the need to maintain existing road infrastructure in a state of good repair is equally important as investing funds to expand or upgrade the existing road network. The Policy therefore advocates:

a. Maintenance of existing infrastructure

The existing road infrastructure and assets must be maintained using the state-of-the-art construction management technologies. Modern technologies should be deployed for smart monitoring of the existing road infrastructure so that timely interventions are made to rehabilitate deteriorating infrastructure.

b. Upgradation of road infrastructure

Responding to the increase in travel demand, existing road infrastructure should be upgraded accordingly. Examples may include unpaved roads upgraded to paved roads, undivided single lane roadways upgraded to divided freeways, dualization and widening of roads. Approach will be based on following criteria:

- ❖ Functional classification of Road
- ❖ Travel demand model
- ❖ Capacity Evaluation of each sections
- ❖ Capacity Evaluation of Nodes/ Intersections
- ❖ Projection of traffic based on best forecast options.
- Safety Evaluation

c. Construction of new road infrastructure

New road infrastructure shall be developed in response to increasing demand for mobility and freight transport. The decision to invest in new road infrastructure be made on best practices, including but not limited to multi-objective evaluations using benefit cost analysis and other similar methods. Following methods will be adopted;

- ❖ Network level mapping will be prepared
- ❖ Network level travel demand will be analyzed
- ❖ Related software-based analysis techniques will be used
- ❖ New bypass will be created to mitigate congestion in cities and towns.

d. Improvement and New Construction Plan

Planning and Design Directorate Punjab Highway Department will maintain a systematic five years plan for up gradation of existing roads and construction of new roads based on analysis of network model and traffic demand model.

e. Plan Development Process

A project development process shall be adopted. Following will be included:

- i. Concept Stage
- ii. Detailed Plan Preparation Stage
- iii. Functional Classification Procedure

(Appendix "N" describes the justification and elements of each report).

f. Geometric Design Principles

"Punjab Geometric Design Manual along with AASHTO Green Book, where required, will be adopted for design.

However, exception will be for vertical control where Guidelines for South Asia recommend that trucks load pattern is different and mostly trucks overload and load to horsepower ratio is 400kg/horsepower.

Rating for Scorecard

For rating by Score Card Method, in addition to project justification report following information will be included in project feasibility report:

- ❖ Functional classification
- ❖ Capacity analysis of road section and nodes/intersection
- ❖ Economic Internal Rate of Return & Benefit cost ratio
- ❖ Rating score

Safety Audit

After approval of concept stage and administrative approval for final design, safety audit will be carried out by designated agency.

Pavement Design

Pavement Design is an essential part of overall design aspect of the project. Pavement structural design will be carried out based on Traffic Studies and Cumulative Equivalent Single Axle Loads (CESAL) calculations:

CESAL \leq 4.0 Million
Overseas Road Note 31

CESAL > 4.0 to 20.0 Million
AASHTO 1993

CESAL > 20 Million
Design based on AASHTO but will also be checked on Punjab Geometric Design Manual



TASKS

The Punjab Road Sector Policy covers all aspects of planning, construction, maintenance, and evaluation of road infrastructure. The specific tasks covered in the Policy include the following.

a. Planning of Roads

Road infrastructure planning is an extension of socio-economic planning with a focus on meeting the current and future mobility needs for people and goods. The planning of road infrastructure thus requires expertise in diverse fields such as economic development, demographics, civil engineering, financial planning and cost accounting.

Since road infrastructure performs best when it is developed as a network, the planning mandate must therefore focus on developing and maintaining road networks throughout the province to provide a competitive edge to businesses and efficient and safe transportation to travelers.

The Policy recognizes that road planning is a continuous exercise rather

than a one-off activity. Therefore, the policy recommends establishment of a strategic planning directorate with dedicated professional staff and leadership to plan for current and future mobility needs.

Planning and Design Directorate Punjab Highway Department will maintain a systematic five years plan for up gradation of existing roads and construction of new roads based on analysis of network model and traffic demand model.

a.1 Evaluation and Prioritization of Alternatives

Given the scarcity of development funds, less than adequate resources are available to invest in all priorities at the same time. Therefore, a subset of projects is prioritized over others. The policy recommends that project evaluation and prioritization of competing alternatives is accomplished using state-of-the-art in multi-objective evaluation and decision-making. A Score Card developed by Punjab Economic Research Institute (attached within detailed technical appendix C) serves the purpose and be adopted for identification of preferred projects of



The policy recommends establishment of an independent wing in the afore-mentioned proposed directorate to conduct independent evaluations of competing alternatives for road infrastructure development, maintenance, or upgrading. The evaluation made by the wing shall be made part of the planning proformas i.e., PC-1 for evidence-based decision-making by the Administrative Authority prior to submission of the projects to the Planning and Development Department.

b. Asset Management Systems

Road Asset Management Systems (RAMS) are defined as "A systematic process of maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing tools to facilitate a more organized and flexible approach to making the decisions necessary to achieve the public's expectations".

RAMS is a model, a decision support system, and a management approach that can be used across Department to address five core questions:

- ❖ What is the current state of physical assets?
- ❖ What are the required levels of service and performance delivery?
- ❖ Which assets are critical to sustained performance?
 - What are the best investment strategies for operations, maintenance, replacements, and improvement?
- ❖ What is the best long-term funding strategy?

With almost 80,000 km in road assets across Punjab, the task to maintain the assets in a state of good repair could prove daunting unless modern



Information Technology (IT) solutions are deployed for real time monitoring of the road infrastructure.

Asset Management Policy requires that service level parameters are developed indigenously in terms of Present Serviceability Rating (PSR) and International Roughness Index (IRI). Therefore, Road Policy adopts parameters as established at Federal Highway Administration (FHWA) (placed at Appendix "J"). However, parameters will be replaced once a mature system is placed and developed or may adopt Service Level parameters developed by RAMS NHA.

For purpose of Linear Referencing of Assets, a 12-digit coding method will be adopted (as attached at Appendix "K")

b1. Smart Infra Monitoring

The Policy recommends that smart infrastructure monitoring be deployed across the province to collect, archive, and analyze real-time data using smart sensors, cloud-based data storage, and state-of-the-art analytics to enable preemptive interventions to maintain the structural integrity of roads.

Technical support will be provided by Road Asset Management Directorate in C&W Department. Smart monitoring parameters will be developed and implemented in consultation with IT consultants

c. Financing of Road Infrastructure

The demand for road infrastructure construction, maintenance, and upgrading far exceeds the resources available to the relevant public-sector authorities responsible for keeping the infrastructure in a state of good repair. The current financial models rely completely on the public sector to provide funds for construction of new infrastructure and maintenance and upgrading of the existing infrastructure.

The Policy recommends exploration of innovative financing models to reduce financing burden on the public sector. Specifically, the Policy advocates the need for exploring the greater participation of the private sector in financing the construction and maintenance of road infrastructure. Such innovations will complement the existing practice of relying on private-sector contractors to undertake all civil works related to road infrastructure.

The Policy recommends a review of the state-of-the-art in infrastructure finance that embraces variants of public-private partnership, land value capture, tax increment financing, road user fees, and dedicated fuel taxes to support road infrastructure development. Involving private capital in infrastructure development not only reduces the

financing burden on the public sector, thus creating fiscal space for government to invest in other equally important sectors, such as health and education, but it also brings fiscal prudence, financial discipline, and a focus on return on investment to ensure that financially and socially viable projects are undertaken on a priority.

The Policy also recommends exploring ways to improve cost recovery from road users, who except for Motorways and some highways, either not pay at all or only marginally for the maintenance and upkeep of road infrastructure. Exploring mechanisms to recover capital and maintenance costs from road users shall be a priority for public sector authorities.

A Provincial Road Fund (PRF) must be established with the seed money from the government and the opportunity for the private sector to invest in new road infrastructure development in Punjab.

Since segregated disbursements of funds often enters payments to contractors, improve disbursement mechanisms be explored at the earliest.

Given the high cost of construction projects, the budget of the Departmental Development Sub Committee (DDSC) may be increased.

The size of Annual Development Plan (ADP) must commensurate on available resources during the year to avoid delays and resultant cost escalations.

❖ One-line budgeting for C&W Department to be adopted to avoid procedural delays.

Built-in provision to be made for price escalation as admissible under provincial government rules.

d. Monitoring and Evaluation (M&E)

At any given point in time, construction, maintenance, and upgrading work is being conducted on hundreds of

The Policy recommends enhancing monitoring and evaluation capabilities of ongoing civil works in Punjab through ICT based technologies.

GOVERNANCE AND ENFORCEMENT OF THE POLICY

The rapid increase in the demand for people and goods movement necessitated the need to create new public-sector entities. The mandate and scope of these entities is defined by the respective acts. At the same time, road infrastructure construction and maintenance has been regulated by specific acts and legislations, such as the Highway Ordinance of 1959. Additionally, relatively recent legislation, such as the Punjab Local Government Act of 2019, is an example of a legislation that intersects with the classification and regulation of road infrastructure. At the same time, successive governments have introduced development plans for targeted investments, such as the Punjab Economic Integration Plan, Punjab Growth Strategy, Punjab Spatial Strategy 2047.

The Policy recognizes the need for coherence in legislative frameworks to guard against overlapping of mandates, confusion in the ownership of infrastructure, and gaps in administrative responsibilities. Therefore, the Policy recommends the legal arm of the government of Punjab to undertake a systematic review of all acts and pieces of legislation that directly or indirectly influence the construction, maintenance, and upgrading of road infrastructure.

C&W Department is the custodian of the Punjab Road Sector Policy and will be responsible for its periodic update. The Department shall be responsible to interact with other public-sector authorities who are mandated to maintain, construct, or upgrade road infrastructure under their jurisdiction. Following the consultative process, the Policy will, over time, streamline overlapping mandates to eliminate redundancies and gaps.

To ensure that the Policy remains a living document, C&W shall conduct reviews of the Policy every two years to address emerging challenges and pursue concordance with other provincial policies related to the road and transport, environment, urban



a. Legal cover

It is recommended that the Government of Punjab must introduce a new act to provide legal cover to the Punjab Road Sector Policy to define the parameters for the interactions between various public-sector departments and authorities related to infrastructure development.

ADMINISTRATIVE RESTRUCTURING AT DEPARTMENT

An effective enforcement of the road sector policy by C&W requires strengthening of human capital in diverse fields to extend the competency beyond engineering domains. As it stands today, the Department holds exceptional talent in engineering departments to meet the growing challenges related to all aspects of engineering. However, the scope of the policy extends far beyond the engineering problems and challenges. The policy therefore recommends the establishment of the following additional directorates of the C&W department.

a. Strategic Planning Directorate

The Strategic Planning Directorate will act as the inhouse thinktank at the C&W department to provide expertise and guidance to internal and external stakeholders. The directorate will be the primary resource for expertise required in all aspects of project development and will complement the engineering excellence presently on staff. The strategic planning directorate will also develop in-house expertise by acquiring or retaining experts in regional and spatial economic development and environmental economics.

Since the road sector policy will deal directly with linking economic zones and clusters and providing better

accessibility from farm to markets, the Strategic Planning Directorate will retain industrial economists, agricultural economists, and transport economists to undertake feasibility of competing alternatives for infrastructure development and ex-post evaluation of completed projects for their success in achieving policy objectives. Additional experts specializing in infrastructure finance, especially focusing on multi-objective evaluation of alternatives, will also be part of the economic team of the directorate.

At the same time, the team will also include specialists in supply chain and logistics management to ensure that improvements made to infrastructure deliver the maximum return on investment for goods movement.

b. Planning Data Bank

Evidence-based decision-making relies on the availability of timely and comprehensive data. Development of road infrastructure involves collection of data related to geotechnical engineering, surveying, human settlements, industry location, topography, agricultural productivity, and household demographics to name a few.

One of the key challenges facing infrastructure development in Punjab is the lack of reliable and timely data. Even when data exist, a lack of data sharing agreements between government departments and other public-sector stakeholders keeps empirical evidence out of the reach of planners and engineers.

The Policy recommends establishing a Planning Databank within the auspices of C&W Department. The Databank will act as the primary data collection and archiving authority in Punjab with the mandate to collect necessary data required for all aspects of infrastructure planning and the responsibility to share data readily with public sector stakeholders and academia when requested. The Planning Databank shall

The Policy recommends a feasibility analysis of establishing a Databank be undertaken at the earliest to identify the extent of resources and scope of activities required to establish the Punjab Planning Databank in the fiscal year 2020 – 2021 or sooner.

The Databank will deploy the state-of-the-art cloud-based computing and data storage. The Databank will be staffed with experts in data archiving, geographic information systems, and analytics/data science.

b 1. Intelligent Transport Systems (ITS)

The Policy recommends implementing Intelligent Transport Systems (ITS) as part of the planning Databank on major highways, primary, secondary and local roads in Punjab to monitor traffic and freight volumes. Such data are needed to improve commuting speeds, reduce freight transport cost, improve road safety. ITS is mainly concerned with information i.e., collection, sharing, processing, and redistribution of information to facilitate easy movement of people and goods. Therefore, the system to be employed by Punjab province shall:

- ❖ Ensure ease of access
- ❖ Enable inter-modality
- ❖ Maintain consistency with international standards
- ❖ Promote data sharing

Deployment of ITS in Punjab shall be as per system engineering approach, which advocates for:

- ❖ Improved stakeholder participation
- ❖ More adaptable, resilient systems
- ❖ Verified functionality and fewer defects
- ❖ Higher level of reuse from one

project

- ❖ to the next, and

Better documentation

c. Documentation Directorate

The policy recommends establishing a Documentation Directorate to archive documentation related to the infrastructure development. Road infrastructure projects generate a wide variety of documentations including engineering drawings, feasibility reports, design and operational manuals, and evaluation reports. The Documentation Directorate will act as the library for all existing and proposed road infrastructure projects.

This Directorate will be responsible to inspect documentation submitted by public sector authorities to ensure that design standards are uniform throughout the province. The Documentation Directorate will circulate agreed-upon standards and metrics and engineering codes to all public-sector and private sector stakeholders.

d. Asset Management Directorate

With over 80,000 km of roads currently in place, the need for state-of-the-art Asset Management Directorate is acutely felt in Punjab. The Asset Management Directorate will be responsible to collect regular and timely data on the state of road infrastructure in Punjab. The Directorate will disseminate timely information to collaborating stakeholders using state-of-the-art in communication technologies. It will also be responsible to maintain dashboards carrying live data on the state of infrastructure for the principle of executives and practitioners in Punjab.

The Asset Management Directorate will be the foremost entity responsible for identifying needs to improve deteriorating road infrastructure. It will rely on the state-of-the-art in remote sensing technology including physical sensors that communicate wirelessly the

e. Monitoring and Evaluation Directorate

At any given point in time, construction, maintenance, and upgrading work are being conducted on hundreds of kilometers of roads in Punjab. Monitoring and evaluation of ongoing civil works is a critical prerequisite for the construction of sustainable infrastructure in Punjab.

The Policy recommends establishing a Monitoring and Evaluation Directorate to oversee all civil works related to road infrastructure in Punjab. At the same time, this Directorate will also be responsible to file timely reports on the status of ongoing projects to Documentation Directorate for further distribution to relevant stakeholders.

f. Safety Audit Directorate

To ensure that road projects conform to international safety standards, the policy recommends establishing a safety audit directorate which shall be responsible to conduct pre-and post-design and construction safety audits and Black Spot Analysis. The directorate shall also collect accident data on regular intervals and propose recommendations for design improvements as required.

g. Additional Capacity Building at C&W

Human Resource Management Systems (HRMS) shall be employed for performance based monitoring of employees.

Close links need to be developed between academia and field engineers. Ideally, an internship program for a period of one year may be launched for engineering students.

Capacity building of Human Resources through local and foreign training shall be done on periodic basis. This will help upgrade skills with respect to modern construction techniques and procedures.

Modernization of mechanical workshops in C&W shall be carried out to make the institution on par with modern world.

Upgrading of existing obsolete Roads and Buildings Research Labs shall be done based on priority. This is because without research and development, construction standards and procedures cannot be customized as per local needs. A dedicated professional work force shall be employed for these Roads and Buildings Research Labs.



CLASSIFICATION OF ROADS

Roads could be classified based on different criterion, such as the following:

Functional Classification: Roads could be classified based on their functionality, which is often defined in terms of traffic volumes or hierarchy. Commonly used functional categories include primary, secondary, and tertiary roads. Functional Classification of Roads will be adopted, based on FHWA guidelines. Road Network will be classified and color coded accorded for FHWA Guidelines "Highway Functional Classification Concepts, Criteria and Procedures".

Administrative Classification: Roads may also be classified based on their location or administrative hierarchies. Commonly used administrative classification includes rural, local, or urban or municipal roads. Intercity highways or urban freeways are also examples of administrative classification.

Numbered Road Classification: Whereas most roads are named, some are also numbered based on the hierarchy of road usage or functional class. For instance, interstate freeways in the United States are often numbered using two digits whereas state highways are numbered using three digits. Numbering of road is already being done for major and minor arterials with 3 digit 'P' Numbers which will continue as before. Detailed Procedure for numbering and along with classification and procedure for numbering is needed to be developed. Asset Management Policy requires that Numbering of road for use in linear referencing of road asset is required for digitizing and referencing of road assets.

a. Mixed Traffic and Informal Vehicles

A greater diversity of road users is

observed in Punjab where formal and informal motorized vehicles share road space with non-motorized road users facilitating both people and goods movement. The Policy recommends that the Road Classification regimes be mindful of the diversity of road users in Pakistan. The government should enforce vehicle operating standards for various road types to minimize differences in operating characteristics to improve road safety and operating efficiencies of the road system.

The Policy recommends a flexible road classification regime mentioned in technical appendix B based on the needs and intended use. However, the Policy mandates a consensus on definitions and nomenclature used to classify road infrastructure throughout the province.



AXLE LOAD MANAGEMENT

Over-load freight vehicles are the single largest source of road infrastructure deterioration in Punjab. A strict adherence to axle load guidelines as notified by NHA and included in the Technical Appendix B, will limit deterioration of road infrastructure and save public funds dedicated to rehabilitating roads.

a. Weigh Bridges

Weigh bridges shall be deployed on major roads to curtail overloaded vehicles. The Office of the Directorate General of Industries, Prices, Weights & Measures (Industries Department) shall scrutinize and calibrate all weigh stations either installed by the public or private sector to ensure standardization of weights.

b. Overloaded Vehicles

Transport Department mandated to enforce axle load on the roads in conformity to road design shall be encouraged to monitor heavy vehicles and penalize for overloading

c. Overloading Data Management System

Directorate of Asset Management will develop real time Data Management Information System of overloaded vehicles and keep record for identification of repeated offenders. Directorate will carry out Analysis of overloading and recommend factors to compensate for overloading in design of pavements.

PUBLIC TRANSPORT AND PEDESTRIAN INFRASTRUCTURE

A well-designed bus bay and bus shelter would enhance the safety of passengers, minimize disturbance to traffic flow, reduce road congestion as well as improve the service quality of public transport services for passengers. Therefore, bus bays and bus shelters should be properly planned and constructed. Further, in urban locations, provision of walkways would maximize safety of both pedestrians and road users. The policy proposes the mandatory provision of pedestrian infrastructure, bus bays and bus shelters in the planning, design and construction of new roads/ highways and while maintaining and upgrading existing roads.



ROAD CLASSIFICATION FOR PAKISTAN

For Pakistan, roads are classified into six distinct categories according to the function they serve and attributes they possess. A brief outline of each road class is given as following.

a. Motorways

Motorways are the high-speed roads that provide largely uninterrupted travel with controlled access, dual carriageway and designed for high speeds typically ranging 100 – 120 KPH with restrictions on certain vehicle types. Examples include M1, M2 etc.

b. Expressways

Expressways are multiple-lane, high-speed toll highways that are upgraded versions of National highways but differ from Motorways by having less access restrictions.

c. Highways

Highways provide largely uninterrupted travel between cities and districts with full access and are designed for high speeds ranging from 70 – 100 KPH. Highways can either be single or dual

carriageway. Examples include the N5, N70 and provincial highways of Punjab.

d. Primary Roads

Primary roads provide the highest level of service at moderate speeds of 60 – 70 KPH with some degree of access control and having a dual carriageway for the longest uninterrupted distance collecting traffic from Motorways/Highways and distributing to the Secondary Roads.

e. Secondary Roads

Provides a less developed level of service at low speed for shorter distances by collecting traffic from Local Roads and connecting them with Primary Roads and vice versa. Speed ranges from 40 – 60 KPH and roads can be either single or dual carriageway.

f. Local Roads

Roads have the lowest speed limit and carry low volumes of traffic and connecting with secondary or primary roads. Typically, these roads are single carriageways with speeds not exceeding more than 40 KPH and in some areas, these roads may be unpaved. Examples include farm to market roads, streets, galis.



Classification of roads based on its functionality along with its attributes

Sr. No.	Classification	Spatial Level	Sub Class	Carriageway	Access	Speed	Travel Lane	Examples
1	Motorways	Regional		Dual	Fully Controlled	100 - 120 KPH	2 or More Per Direction	M1, M2, M3 (NHA), Ring Road Lahore
2	Expressways	Regional	Ring Roads	Dual	Partial Controlled	80 – 110 KPH	2 or More Per Direction	E35, E75 (NHA), Ring Road Lahore, Karachi
3	Highways	Regional	1. Provincial Highways, 2. National Highways	Single/Dual	Fully Access	70 - 100 KPH	Up to 2 Per Direction	N5, Jhang-Faisalabad Road, Lahore Sargodha Road
4	Primary Roads	Urban	Major Collectors Major Arterials Minor Arterials	Single/Dual	Partial Controlled	60 - 70 KPH	Up to 3 Per Direction	Jail Road Lahore, Canal Road Faisalabad
5	Secondary Roads	Regional/ Urban/ Rural	Minor Collectors	Single/Dual	Fully Access	40 - 60 KPH	1 or 2 Per Direction	Davis Road Lahore, Rural Paved Roads connecting villages to Primary Roads
6	Local Roads	Urban/ Rural	Farm to Market Roads Streets Galis	Single	Fully Access	Max. 40 KPH	Max. 2 lane both Directions	KPRRP/Village Roads, Urban streets etc.



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