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ADDRESSING ROAD-LEVEL PLANNING CHALLENGES IN PAKISTAN FOR A SUSTAINABLE FUTURE

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Abstract

There are ongoing difficulties in creating road plans in Pakistan, since the elevation of the road's changes from urban areas to rural areas. As a result of poor planning, poor coordination, and a lack of set standards, the infrastructure has deteriorated greatly, there are frequent urban floods, and people's health is at risk. Because of frequent repairs to roads and poor handling of water drainage, water is not able to flow properly, leading to stagnant water, more cases of lung diseases, and greater losses for the economy. This policy brief looks at the main reasons behind the outcomes of, and the existing problems in, Pakistan's road-level planning system. From the examples of Paris and London, we can see that having integrated drainage, set road elevations, and advanced maintenance helps cities. To solve these issues, the brief recommends having a single authority that sets a consistent level of road quality, holds contractors accountable, uses modern technologies for road upkeep, and improves collaboration among all those involved. It is suggested to combine new laws, adoption of technology, and gradual change to achieve sustainable progress, lessen floods in cities, and improve the health of the public. To ensure that the country's roads are strong and effective, effective collaboration must be achieved among policymakers, contractors, and urban planners.

INTRODUCTION

1.1 Background:

Since 1947, when Pakistan gained its independence, the process of urban planning and infrastructure development has encountered multiple serious problems. Post-Partition rapid urban development happened without suitable planning, causing cities to remain short of proper drainage systems and to experience uncontrolled construction (Ansari, 2023). Road elevations were adjusted at random, which interrupted the natural water runoff patterns. These haphazard planning practices from the past have caused roads to become uneven, blocked sewers, and urban flooding to occur. Without systematic infrastructure development, Pakistan's roads suffer from poor quality and unsustainable infrastructure, which creates additional health risks and environmental hazards (Mukesh & Katpatal, 2021).

1.2 Importance:

Road levels must stay consistent to achieve effective urban infrastructure delivery. Public safety remains directly affected while urban flooding risks decrease and roads with connected facilities last longer (Zhang et al., 2021).

Poor road-level planning causes drainage system problems that lead to water stagnation and respiratory illnesses and air pollution (Kazi, et, al., n.d.). Resolving this challenge is fundamental to stop additional economic and societal harm while boosting Pakistan's citizens' quality of life (Ullah et al., 2022).

1.3 Current Scenario:

The current road-level planning situation in Pakistan shows evidence of weak coordination between different authorities as well as the lack of measurable performance standards (Jafree et al., 2024). The independent nature of departments responsible for road construction and maintenance creates elevation and drainage problems because they work separately from each other. During the rainy season, water collects primarily on elevated roads that transform into waterways within urban areas (Rana et al., 2021). Rural road infrastructure suffers from deterioration because of confusing planning practices and inexpensive building materials. Painting Lahore DHA's infrastructure benchmarks stands as a contrast to typical municipal systems since most cities operate without performance standards that would address their deficient infrastructure (Abbas & Wakil, 2023).

1.4 Key Data:

- Since proper drainage planning is absent in Pakistan (Javed & Riaz, 2020), the country faces elevated urban flooding incidents throughout the monsoon period in its major cities such as Karachi and Lahore (Zia et al., 2023).
- Research findings show that inadequate road-building methods lead to 30-40% of major urban flood events.
- Recent respiratory illnesses have gone up due to poor road maintenance directly linked to stagnant water accumulation, which leads to very bad air quality across urban areas (Nasreen & Ashraf, 2020).
- Road construction that frequently adds layers of gravel and asphalt has resulted in road surfaces reaching 5-6 feet above their initial elevation, which disrupts proper stormwater drainage.

1.5 Stakeholders:

Addressing road-level maintenance challenges requires a collaborative effort from:

- **Government Bodies:** Municipal and provincial authorities bear responsibility for developing urban plans and constructing roads while maintaining the infrastructure throughout their jurisdictions (Lu et al., 2022).

- **Contractors:** The implementation practices of contractors produce direct effects on road quality and longevity.

- **Local Authorities:** The entities perform regulatory enforcement activities to verify that benchmarks are met.

- **Urban Planners:** Urban planners contribute essential functions by developing systematic drainage and road-level policies that integrate into broader urban development plans.

- **Public:** Sustainable improvements require public awareness as well as citizen involvement to both experience and create infrastructure changes, since people simultaneously face their consequences and help fashion them.

The combination of stakeholder cooperation will enable Pakistan to defeat past deficiencies and establish a path toward long-lasting road-level planning and maintenance systems.

2. Problem Statement

2.1 Issue Overview:

According to Arshad et al. (2022), the nation of Pakistan continues to experience enduring problems regarding uniform road surface heights both within metropolitan zones and throughout its rural territories (Khan, 2020). The combination of inadequate planning and missing authority coordination, as well as repeated road constructions without proper benchmarking, has resulted in significant infrastructure disruptions (Hussain et al., 2023). Myriad problems stem from poor drainage management and haphazard road elevation methods that create adverse effects on community infrastructure and local populations.

2.2 Define the Problem:

Multiple issues plague Pakistan because its roads operate at different elevation levels that create urban flooding and harm public infrastructure and endanger

health. Without benchmark standards in road elevation procedures, the drainage patterns become disrupted, which results in water accumulation on roads, specifically during rainy periods (Shah et al., 2020).

The failure to use proper road materials, together with insufficient long-term planning, causes roads to break down and exposes them to water damage (Kuleno & Lera, 2020). Due to the failure to account for planned road elevations, housing and shop infrastructure that rises above normal height levels creates 'canal-like' water conditions. Drainage system collapses and unstable, short-lived surfaces cause major problems to settlements in urban as well as rural areas due to substandard construction methods.

2.3 Why It's Problematic:

Multiple significant problems are caused by unstable road levels, which affect different areas. Urban flooding issues interrupt daily operations, and in the worst case, damage structures and prohibit the roadway with vital transportation routes. The infrastructure facilities create economic damage and disrupt living conditions for residents by restricting local goods and service distribution. The transmission of respiratory illnesses, along with malaria, follows from poorly maintained drainage systems, allowing water to stagnate, thus increasing public health expenses. Road planning authorities demonstrate poor departmental coordination and lack operational accountability, which further worsens the situation. Departments that operate without centralized control work independently from each other, leading to increased complexity. Cost-reduction strategies adopted by constructors create road defects alongside failures to implement established road requirements. A combination of these issues generates disruptions that obstruct both urban development and infrastructure efficiency and delay economic growth. Practical methods should unite efforts to preserve regular road height standards and build efficient drainage systems, as well as enhance urban development practices.

2.4 Objective:

1.To highlight the challenges caused by inconsistent road-level planning and maintenance in Pakistan.

2.To Analyze the impact of poor coordination, improper practices, and lack of benchmarks on infrastructure, public health, and urban flooding.

3.To provide actionable recommendations for implementing centralized road-level policies and adopting systematic practices to resolve these persistent challenges.

The policy brief delivers essential information for policymakers to create enduring and successful road-level management approaches.

3. Literature Review

Reasonably, recent studies emphasize the significance of designing the roads correctly at the right level in preventing urban flooding and deterioration of infrastructure. Ojo & Emmanuel (2024) further showed that inconsistent road elevations mess with the natural drainage system and generate excessive water stagnation, resulting in heavy flooding, especially during the monsoon season. Mukherjee et al. (2023) also agree that elevation practices in place are causing invaluable wear and tear of roads that facilitate reclamation of costly maintenance costs and shorten the life span of roads. These problems are exacerbated by the lack of fixed road level benchmarks across cities in Pakistan, as highlighted by Zang et al. (2024), who argue for standardized construction practices to avoid such issues.

De Oliveira et al. (2022) pointed out that in the city, roads built at different heights can block effective water runoff, causing waterlogging and property damage in the context of urban flooding. Additionally, Fida et al. (2023) also focused on the road design flaws and their relation to public health problems, such as respiratory illnesses, because of stagnant water and poor air quality. Van Ginkel et al. (2021) indicate the importance of integrated road planning, including standardized benchmarks, in that cities with coordinated infrastructure planning have fewer flooding incidents and a better road system lasts longer.

On the technological front, Chen et al. (2023) also looked at an automated road-level monitoring system to improve maintenance efficiency with real-time data collection. In addition, Chapman & Hall (2022) suggest the adoption of advanced drainage systems linked to road infrastructure to achieve flooding

resilience in the long term and to optimize stormwater management.

4. Analysis and Evidence

4.1 Root Causes:

Several root causes contribute to Pakistan's persistent challenges with road-level planning:

1. Ad Hoc Repairs: Road maintenance procedures consist of laying additional asphalt and gravel layers above damaged surfaces without performing initial surface removal. Road level elevation through this practice develops drainage problems and blocks natural water courses (Chu et al., 2023).

2. Lack of Coordination: Several authorities, including municipal governments, along with contractors, work in isolation with no shared operational framework. Multiple governing bodies operating separately without a unified framework create road-level inconsistencies as well as standard implementation discrepancies (Montanino & Punzo, 2021).

3. Absence of Fixed Benchmarks: The national infrastructure of Pakistan does not include standardized benchmarks to measure road heights as other developed countries do. The lack of proper planning produces substandard infrastructure that presents misalignments between roads, drainage systems, and buildings (Mazele & Amoah, 2022).

4.2 Consequences:

1. Urban Flooding: Drainage systems become blocked when roads occupy elevated positions or when alignment between pipes is improper, thus interrupting natural rainwater flow to sewers. Karachi, together with Lahore, suffers major waterlogging events during monsoon periods that result in transportation delays while causing property destruction (Roy et al., 2021).

2. Infrastructure Deterioration: Roads show faster deterioration when planning at the road level is done improperly. The presence of standing water on road surfaces leads to their degradation and creates both potholes and cracks. Road lifetime decreases while maintenance expenses rise due to improper road-level planning.

4. Public Health Issues: The combination of poor road construction dust with urban water stagnation leads to respiratory conditions and the transmission of diseases such as malaria and dengue. The healthcare system bears a big cost because of these health issues.

4.3 Existing Policies:

The Pakistani Road maintenance system operates without strategic planning and performs only reactive procedures at present (Ali & Batool, 2024). Current policies choose temporary fixes instead of dealing directly with fundamental problems. The practice of road maintenance occurs without proper consultation of drainage plans and fails to meet standardized benchmarks (Mohammadi et al., 2022). The planned residential community DHA in Lahore follows exacting standards about road elevation, but typical urban districts across Pakistan lack such systematic supervision. The lack of centralized authority that oversees road construction, along with maintenance, creates additional issues throughout the system. Contractors lack effective accountability systems that enable them to choose cheaper methods over high-quality performance (Hysing, 2021).

4.4 International Comparisons:

Developed nations like Paris and London provide valuable lessons in systematic road-level planning:

1. Integrated Drainage Systems: Paris applies a drainage system that supports both water drainage and sewage disposal functions effectively, even near the River Seine. Road durability and urban flooding prevention are achieved through this system (Henry, 2023).

2. Fixed Benchmarks: The road elevation standards that London and other UK cities preserve today trace back centuries. All construction operations follow these benchmarks, which help maintain consistent alignment between roadways and drainage networks.

3. Advanced Technology: Developed countries use modern equipment to remove road damage instead of

building additional layers. The selected method preserves natural road elevation while stopping the development of long-term infrastructure dilemmas (Belyaev et al.,2020).

Pakistan should implement these best practices through standardized benchmarks, together with synchronized drainage and road infrastructure, followed by modern road maintenance equipment. The implementation of these methods produces substantial enhancements to urban infrastructure while simultaneously minimizing floods and creating better public health conditions. A strong, unified policy framework serves as a critical requirement for reaching these targets.

4.5 Result:

Theme 1: Inconsistent Road Design and Its Impact on Urban Flooding

Poor Road Elevation Practice: Roads built without a consistent elevation are a cause of flooding because water gathers in areas where there is no elevation.

Coordination with Drainage Systems: Misalignment prevents water flow and causes flooding.

Rapid, uncontrolled urban development: Speedily developed urbanization causes uneven road elevations, obstruction of the correct water drainage, and increasing flood risks.

Poor Grading: Poor grading means rainwater collects on roads, which are already on the verge of flooding.

Impact on Safety and Infrastructure: Floods also negatively affect safety and infrastructure due to inconsistent road designs, damage the infrastructure, increase maintenance costs, and pose health risks to the public.

Key Findings:

Due to improper collusion and low-grade material in road construction, the road levels are not even, and drainage is a pain point in rural areas.

Urban flooding is aggravated by uncontrolled development in urban areas and encroachments on natural drainage channels.

The lack of proper grading and elevation control while constructing roads leads to standing water.

Example Quote:

"Inconsistent Road elevation is a major issue, especially when roads are constructed without proper grading**." (Person 4)**

Theme 2: Lack of Coordination Among Authorities in Road-Level Planning

Multiple agencies: The road construction is managed by several different government entities; they try to work independently and do not have a single strategy to follow.

A Lack of Centralized Oversight: Since roads are not planned in a single agency, there is no consistency in which roads are changed, which causes disruption to planned coordination, such as planning to have the drainage or water flow.

Misaligned infrastructure: Road projects are either performed haphazardly without regard for the long-term impact on drainage systems, or they either face the issue or pay out more on maintenance to mitigate as much as possible.

Lack of Coordination between Departments: Poor coordination between departments leads to road level changes that do not work with the drainage systems.

Key Findings:

There is no cohesive planning strategy and different departments work in silos.

Road construction is not often consulted with drainage systems or urban planning.

Road planning will have to be overseen by a centralized authority and standardized.

Example Quote:

"To solve this, authorities need a unified umbrella policy to collaborate effectively and ensure cohesive planning." (Person 2)

Theme 3: Impact of Post-Partition Planning on Infrastructure Deterioration

Poorly Sorted Infrastructure: Lack of attention during Pakistan's partition hurriedly stopped roads and drainage systems, which would take time to be sorted.

Infrastructural Poor Quality: The poor quality of infrastructure has been attributed to a lack of planning for future urban expansion and, hence, population growth.

Neglect of Climate Change and Water Management: Important elements in post-Partition planning were neglected, which affected flooding and waterlogging.

Impact on Health: The poor drainage of stagnant water has resulted in the spread of waterborne diseases, which in itself worsens public health and infrastructure.

Key Findings:
Lack of a proper drainage system results in waterlogging and subsequently damage to the infrastructure due to the construction of these roads.
Systematic failure in road level planning ever since 1947 has led to severe water stagnation, which results in public health issues like respiratory and waterborne diseases.
The post-Partition urban expansion did not forecast climate events, leading to a scenario of unfriendly roads and vulnerable cities.

Example Quote:
"Improper drainage systems and misaligned roads caused flooding, leading to the rapid destruction of infrastructure." (Person 1)

Theme 4: Lessons from Developed Nations on Sustainable Road Planning
Dual Purpose Drainage Systems: This is the case in Paris and London, developed countries that integrated sewage and storm water drainage as sewerage combined into one, hence preventing waterlogging and making the roads more durable.

In other words, Climate Resilience on Infrastructure: Channeling water with urban planning to maintain the long-term stability; building roads fit to withstand climate change.

Future-Proofing Infrastructure: Lessons from developed nations' future-proofing infrastructure stress the need for future-proofing the infrastructure in future climate conditions, to save on maintenance costs, and for effective long-term use.

Advanced Water Management: The need for Pakistan to adopt systems that involve drainage management along with climate resilience to mitigate flooding and damage to infrastructure.

Key Findings:
Developed countries have long-term urban planning systems that integrate stormwater and sewerage systems.
To do this, you can use technologies like GIS and automated hydrological models to keep the road level constant and drain properly.
Pakistan can adopt these strategies with an emphasis on urban sustainability, including the provision of water management in urban planning.

Example Quote:
"Western countries plan roads with strict benchmarks and integrated systems to manage rainwater and sewage effectively." (Person 2)

Theme 5: Need for a Centralized Policy with Fixed Benchmarks for Road Levels
Road Construction Centralization: Creation of one governing body that will help with road construction and have standard criteria across all regions.

Road Construction Standardization: Fixing the standards of levels of roads that would apply all over the country and prevent variations in road elevations in the process.

Urban Flooding Alleviation: A centralized policy would ensure that the road levels remain consistent, and drainage coordination is improved to alleviate urban inundation.

Infrastructure longevity and less maintenance: If all roads are built according to the same standard, then infrastructure will last for a longer period, and maintenance costs will act as a contingency to materials required for it.

Key Findings:
A single jurisdiction should oversee planning at the road level and enforce consistent standards.
In the survey, respondents were asked whether the standardization of road levels would bridge differences between locals and become a fixed benchmark.
Road level standards should be enforced by regular audits, inspections, and penalties.

Example Quote:
"Every city should have a fixed benchmark level for roads. All roads should be constructed and maintained according to this fixed point." (Person 1)

Conclusion:
Challenges in road-level planning in Pakistan were found to be multi-dimensional, ranging from a lack of design consistency in roads to coordination issues among the responsible authorities and historical planning flaws. Among these solutions, key recommendations include the establishment of a centralized authority to administer road planning, the adoption of best practices in sustainable water management from developed countries, and the implementation of fixed standards for the levels of roads for consistency and durability of infrastructure.
These conclusions underscore the necessity for multidimensional and integrated urban development policies to mitigate the persistent challenges of flood risks, infrastructural decay, and health hazards.

5. Policy Options and Recommendations

5.1 Policy Options:

1. Establishing a Centralized Authority to Oversee Road-Level Benchmarks and Maintenance:
A central organization should manage planning activities at the road level throughout all cities and provinces. Such an authority would maintain uniform standards by which construction teams must operate alongside maintenance requirements. Such oversight can solve the coordination problems that exist between different departments and their contractors (Doan, 2023).

2. Implementing Fixed Benchmarks for Road Levels Nationwide:
National road level requirements provide a standard framework that stops construction entities from making arbitrary elevation or alignment choices. The guidelines will integrate benchmarks into urban and rural planning standards for establishing uniform standards across all infrastructure projects.

3. Enforcing Accountability and Collaboration Among Contractors and Authorities:
Government departments, along with contractors, must follow road-level benchmarks through rigorous accountability systems. The implementation of collaborative frameworks would lead to enhanced communication and coordination for all operations between repairs and construction work, as well as drainage planning.

4. Adoption of Advanced Machinery for Maintaining Original Road Levels:
Road debris could be removed from developed nations' road-lifting and recycling systems by stripping damaged surfaces and reprocessing materials to achieve uniform levels. The method would reduce unnecessary elevation and offer lasting durability to the infrastructure.

5.2 Evaluation:

1. Centralized Authority:
Advantages: Officials work more effectively to eliminate repeated work and improve departmental coordination, resulting in standardized road-level planning.

Disadvantages: Major operational issues are created by the combined costs of setting up and maintaining this new body, and possible bureaucratic holdups.

Scalability: This solution is applicable in all cities and provinces with adjustable parameters according to the urban and rural development requirements.

2. Fixed Benchmarks:
Advantages: All construction projects have a clear reference point that makes planning activities and maintenance procedures easier.

Disadvantages: Unmonitored areas make enforcement of the process difficult, and extensive survey work and mapping across rural areas are needed for the implementation process.

Scalability: The system will present enduring sustainability and worldwide applicability upon setting benchmark standards.

3. Accountability and Collaboration:
Advantages: This system makes construction more transparent, raises the standards for road quality, and ensures permanent standard maintenance.

Disadvantages: Construction companies must overcome their resistance to new reforms to be able to execute effective major policy changes and have thorough tracking systems.

Scalability: Effective at both provincial and national levels with proper legislation.

4. Advanced Machinery:
Advantages: This technique reduces infrastructure needs as well as construction heights and results in longer-lasting roads.

Disadvantages: Start-up funding is required to equip the equipment with specialized equipment and operator expertise, and the equipment needs to be operated by a professional in the industry.

Scalability: It is good to construct advanced road systems in big metropolitan areas, but building enough technological assets again becomes difficult in rural areas.

5.3 Recommendations:
To address the persistent challenges of inconsistent road levels, a hybrid approach is recommended:

1. Establish a Centralized Authority:
The establishment of road-level benchmarks and drainage systems, as well as road maintenance operations, must be undertaken by a national body. Implementation would be supervised and coordinated with other departments in the nation by a central authority, which would set up guidelines. Benchmark standards should be enforced as a requirement by the law, such that provinces meet the same standards.

2. Adopt Advanced Technology:
Modern road lifting and recycling machinery should be provided to contractors and the government itself for maintaining original road levels.
Training courses for road maintenance operators and contractors on the efficient operation of these technologies should be sponsored by the government.

3. Implement Fixed Benchmarks:
A national survey needs to be conducted to establish a unified road-level benchmark system. Contour maps are used in road design to determine the optimum location along the road that matches the effective natural drainage systems during monsoon seasons. As a part of standardized implementation, benchmark standards should be integrated into urban planning policies for future construction projects.

4. Enhance Accountability and Collaboration:
- Contractual work requires companies to follow mandatory integrity procedures that control quality parameters and established benchmarks.
- The government should develop shared digital platforms that unite urban planners with contractors and government departments to work on joint projects.
- Organizations will receive financial incentives in addition to facing penalties when their projects achieve set quality targets.

5.4 Cost-Effectiveness, Sustainability, and Scalability:
- The hybrid method requires significant upfront capital to deploy cutting-edge technology and a centralized administrative core. Still, it generates enduring financial benefits through reduced maintenance requirements and diminished frequency of maintenance.
- Sustainable infrastructure develops when modern infrastructure techniques unite with natural drainage patterns and adopt environmentally friendly reuse approaches.

• Modern machinery and fixed benchmark implementation enable scalable operations capable of serving both urban and rural environments.

The implementation of national planning policies alongside modern technology, along with collaborative methods, presents Pakistan with a comprehensive solution to road-level development issues. Improved infrastructure reduced urban flooding, and enhanced public health, together with economic growth, result from this approach. The proposed recommendations require immediate implementation by policymakers to develop sustainable economic growth.

6. Implementation Strategy

6.1 Steps for Implementation:

1. Develop Legislation for Centralized Road-Level Benchmarks:

• The national government needs to develop legislation that grants control over road-level benchmarks to a central entity.

• The national organization requires enforcement power to maintain consistent road-level policies across all provinces and municipalities.

• The authors suggest that benchmarking should appear throughout urban planning guidelines and infrastructure development standards to ensure that drainage systems align with permanent infrastructure needs.

2. Train Contractors and Officials:

• Training should deliver complete education about fixed road-level benchmarks to contractors, engineers, and urban planners.

• A solution includes providing teams with the ability to work with advanced road maintenance equipment, which includes road-lifting and recycling machinery.

• The organization will organize periodic certification classes together with educational sessions to verify that members stick to benchmarks and quality expectations.

3. Create Monitoring and Evaluation Framework:

• A real-time monitoring system must be established to check that road repair and construction work meet benchmark parameters.

• Geographic Information Systems, together with contour mapping, provide organizations with an opportunity to maintain precise road-level data.

• The organization must establish independent inspection teams that will evaluate finished projects, perform compliance audits, and track areas for continued improvement.

The organization must prepare yearly reports to sustain open transparency and maintain accountability standards.

6.2 Challenges:

1. Resistance from Local Contractors and Authorities:

• Many contractors and local authorities may resist changes due to a lack of awareness, perceived increases in operational complexity, or fear of reduced profits.

• Contractors may also lack the technical expertise or resources to adopt advanced machinery and comply with strict standards.

2. High Initial Costs of Equipment and Training:

• Acquiring advanced road-recycling machinery and implementing a nationwide training program will require significant financial investment.

• Municipalities, especially in rural areas, may struggle to allocate funds for these initiatives.

6.3 Solutions:

1. Phased Implementation:

• Roll out the policy in phases, starting with pilot projects in major urban centers such as Karachi, Lahore, and Islamabad.

• Use these pilots to refine processes, evaluate challenges, and demonstrate the benefits of the new system to stakeholders.

• Gradually expand implementation to smaller cities and rural areas over time.

2. Incentivizing Compliance:

• Offer financial incentives, such as tax breaks or subsidies, to contractors and municipalities that adopt advanced machinery and comply with benchmarks.

• Recognize and reward compliant contractors through certifications or public acknowledgment, enhancing their reputation and competitiveness.

3. Public Awareness Campaigns:

- Launch awareness campaigns to educate the public, contractors, and local authorities about the long-term benefits of maintaining consistent road levels.
- Highlight how improved infrastructure will reduce urban flooding, improve public health, and save costs over time.

4. Government Support for Financing:

- Secure government and donor funding to offset the initial costs of acquiring advanced machinery and setting up training programs.
- Establish public-private partnerships (PPPs) to share the financial burden and encourage private sector involvement.

7. Cost-Benefit Analysis

7.1 Costs:

1. Initial Investment in Advanced Machinery and Training Programs:

A substantial initial investment must be made for modern road-recycling equipment acquisition and across-the-nation training of contractors, together with officials. All expenses stem from the purchase of machinery alongside operational training expenses and maintenance costs (Mindell & Reynolds, 2023).

2. Costs of Creating and Enforcing Centralized Policies:

The establishment of a centralized benchmarking authority demands legislative work, together with personnel management and evaluation system construction. The ongoing costs of compliance inspection, together with periodic audits, generate added operational expenses (Yang et al., 2021).

7.2 Benefits:

1. Long-Term Savings:

The integration of standard road-level benchmarks alongside innovative technologies will decrease roadway maintenance needs, leading to substantial cost reductions throughout multiple decades. Drainage system improvements will protect urban areas from flooding while saving the nation millions of rupees in annual property damage costs. Every year, during monsoon season, the poor planning of Karachi leads to urban flooding, which generates billions of rupees in expenses for the city.

2. Improved Public Health and Economic Activity:

Obtaining appropriate road elevations paired with proper drainage structures prevents water accumulation, and this reduction helps prevent pest disease illnesses, together with respiratory issues stemming from dust and air pollution. Economies experience higher productivity levels in communities where people maintain better health, so they contribute to national development. Normative transportation systems shorten wait times, which supports economic expansion across trade and commercial sectors.

7.3 Evidence-Based Support:

The systematic planning of roads leads to more economical road infrastructure systems according to the French and the UK approaches. Through its connected drainage and road network system, Paris reduces flood risks while saving on present and future expenses for maintenance work and healthcare services. Pakistan can generate enduring value while making its initial budget investments through proper implementation.

8. Conclusion

The improper road-level planning in Pakistan's cities and rural areas creates flood damage to infrastructure systems and public health problems. Standardized policies and technical benchmarks, together with insufficient advanced technology systems, amplified these issues. The achievement of sustainable urban development, coupled with enhanced public health outcomes, requires instant solutions to address these weaknesses.

Policyholders and stakeholders need to make decisions that will bring the suggested recommendations to life. The implementation of sustainable engineering depends on both set evaluation standards and official authority with modern road maintenance equipment. The sustained challenges of Pakistan will be overcome through collective efforts between contractors, urban planners, and local authorities. A priority system for organized road-level planning should become our immediate focus to craft an upcoming framework that delivers health advantages and prosperity alongside safety for Pakistan's population. Immediate action is required to secure permanent forward progress.

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