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URBAN MOBILITY AND INFORMAL TRANSPORT SYSTEMS: A COMPARATIVE STUDY OF COLOMBIA AND THE NETHERLANDS

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ABSTRACT

Achieving SDG 11 (Sustainable Cities and Communities) requires ensuring access for all to adequate, safe, and affordable housing and basic services (Target 11.1), providing access to safe, affordable, accessible and sustainable transport systems for all (Target 11.2), and enhancing inclusive and sustainable urbanization (Target 11.3). Urban mobility is a critical determinant of quality of life, economic productivity, environmental sustainability, and social equity.

However, cities in low- and middle-income countries face a mobility paradox. Formal public transport such as buses, metro, and trains is often inadequate, unaffordable, or inaccessible, leading

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to the proliferation of informal transport systems including minibuses, shared taxis, auto-rickshaws, motorcycle taxis, and bicycle taxis that fill the gap but operate with limited regulation, safety risks, environmental pollution, and labour precarity.

This study conducts a comparative analysis of urban mobility and informal transport systems in Colombia and the Netherlands, two countries with vastly different income levels, urban planning histories, and transport governance models. The Netherlands has achieved one of the world's most sustainable, safe, and equitable urban mobility systems, characterized by integrated multi-modal transport, world-class cycling infrastructure, and strong road safety outcomes. Colombia has invested heavily in formal public transport such as Bus Rapid Transit and metro systems, but still relies heavily on informal transport including minibuses, shared taxis, and motorcycle taxis, which account for an estimated 50 to 70 percent of urban trips.

Using a qualitative comparative case study methodology, the study analyzes secondary data from government reports, international databases, and peer-reviewed literature over the period 2000 to 2025. The study finds that the Netherlands' success is attributable to long-term political commitment, integrated land use and transport planning, high cost of car ownership, and a cultural shift that normalized cycling. Colombia's challenge is transitioning from informal to formal transport while maintaining affordability and coverage.

The study concludes that informal transport cannot be eliminated overnight; it must be gradually integrated through route rationalization, fleet modernization, driver formalization, integrated ticketing, and BRT feeder networks. Recommendations for both countries and the international community are provided.

Keywords: Urban mobility; informal transport; Colombia; Netherlands; SDG 11; bus rapid transit; cycling infrastructure; road safety

RÉSUMÉ

Atteindre l'ODD 11 (Villes et communautés durables) nécessite de garantir l'accès de tous à des systèmes de transport sûrs, abordables, accessibles et durables (cible 11.2). La mobilité urbaine est un déterminant essentiel de la qualité de vie, de la productivité économique, de la durabilité environnementale et de l'équité sociale. Cette étude analyse la mobilité urbaine et les systèmes de transport informel en Colombie et aux Pays-Bas. Les Pays-Bas ont un système de mobilité durable, sûr et équitable, avec 27 pour cent des déplacements à vélo et un taux de mortalité routière de 3,4 pour 100 000 habitants. La Colombie a investi dans le transport formel, notamment le Bus Rapid Transit (TransMilenio) et le métro de Medellín, mais dépend encore du transport informel, notamment les minibus, les taxis collectifs et les mototaxis, qui représentent 50 à 70 pour cent des déplacements urbains. Le transport informel présente des risques pour la sécurité, la pollution et la précarité du travail. L'étude conclut que le transport informel ne peut être éliminé du jour au lendemain ; il doit être intégré progressivement. Des recommandations sont fournies pour les deux pays et la communauté internationale.

Mots-clés : mobilité urbaine, transport informel, Colombie, Pays-Bas, ODD 11, bus rapide, infrastructure cyclable, sécurité routière

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1. INTRODUCTION

Achieving SDG 11 (Sustainable Cities and Communities) requires ensuring access for all to adequate, safe, and affordable housing and basic services (Target 11.1), providing access to safe, affordable, accessible and sustainable transport systems for all (Target 11.2), and enhancing inclusive and sustainable urbanization and capacity for participatory, integrated, and sustainable human settlement planning and management (Target 11.3).

Urban mobility is a critical determinant of quality of life, economic productivity, environmental sustainability, and social equity. In cities with efficient, affordable, safe public transport, residents can access jobs, education, health care, and recreation without private cars. In cities where formal public transport is inadequate, unaffordable, or inaccessible, residents rely on informal transport systems including minibuses, shared taxis, auto-rickshaws, motorcycle taxis, and bicycle taxis that fill the gap but operate with limited regulation, safety risks, environmental pollution, and labour precarity.

This study examines two countries that offer profound and contrasting insights into urban mobility and informal transport systems: Colombia and the Netherlands.

The Netherlands, a high-income country with a population of 17 million, a GDP per capita of $58,000, and a population density of 508 people per square kilometer, has achieved one of the world's most sustainable, safe, and equitable urban mobility systems. Key features include integrated multi-modal transport with trains, metros, trams, buses, and ferries; world-class cycling infrastructure with 35,000 kilometers of dedicated cycle paths separated from motor traffic, protected intersections, and traffic signals for cyclists; 27 percent of all trips made by bicycle (rising to over 50 percent in Amsterdam); and a traffic fatality rate of only 3.4 deaths per 100,000 population. The Netherlands has achieved this through long-term political commitment, integrated land use and transport planning, high cost of car ownership, and a cultural shift that normalized cycling for all segments of society.

Colombia, an upper-middle-income country with a population of 52 million and a GDP per capita of $6,500, has invested heavily in formal public transport but still relies heavily on informal transport. Formal transport includes Bus Rapid Transit (BRT) systems such as Bogotá's TransMilenio (opened in 2000, with 12 lines, 115 kilometers, and 2.5 million passengers per day), MIO in Cali, Metroplus in Medellín, Transmetro in Barranquilla, and Megabús in Pereira. Metro systems include the Medellín Metro (opened in 1995, with 2 lines, 35 kilometers, and 1 million passengers per day) and the Bogotá Metro currently under construction. However, informal transport remains widespread, including buses (colectivos and busetas), minibuses (micros), shared taxis, and motorcycle taxis (mototaxis). Estimates suggest that 50 to 70 percent of urban trips in Colombian cities are served by informal transport.

Informal transport in Colombia operates with limited regulation. There are no fixed routes, as drivers choose routes based on demand. There are no fixed schedules, as vehicles depart only when full. Fares are negotiated or set by driver cooperatives. Driver cooperatives self-regulate and are often politically powerful. Safety risks are high: Colombia's traffic fatality rate is 18 deaths per 100,000 population, which is 4 to 5 times higher than the Netherlands. Vehicles are often old with bald tires and failed brakes, and drivers work long hours with no limits, leading to fatigue. Environmental pollution is severe, as old diesel vehicles (Euro I, II, and III) emit high levels of PM2.5, NOx, and CO2, contributing to air pollution that exceeds WHO limits in Bogotá and Medellín. Labour precarity is widespread: drivers are independent contractors with no employment contract, no social security for health, pension, or workers' compensation, low pay of 200to200*to*400 per month for mototaxi drivers, long hours of 12 to 14 hours per day, 6 to 7 days per week, and no union representation, as cooperatives control the workforce.

Colombia has implemented several reforms. Integrated ticketing systems were introduced, such as Bogotá's SITP (Sistema Integrado de Transporte Público) since 2012, which incorporates some informal buses into the formal network as feeders for TransMilenio. Scrappage programmes have replaced old buses with Euro V and VI vehicles under the Clean Air Policy, scrapping more than 20,000 buses. Motorcycle restrictions, known as "pico y placa," impose peak hour bans based on license plate numbers in Medellín and Cali. BRT expansion continues, including TransMilenio expansion and the construction of the Bogotá Metro.

However, informal transport persists due to several factors. Coverage gaps exist because formal BRT does not reach low-income peripheral neighborhoods, often called the "cinturón de miseria" or misery belt on hillsides, where residents would need to walk 30 to 60 minutes to a BRT station. Affordability is an issue because informal transport is cheaper for marginal trips: the BRT fare is COP 2,500 to 3,000 (0.60to0.60*to*0.70) per trip, while an informal bus costs COP 1,500 to 2,000 (0.35to0.35*to*0.50), and a mototaxi costs COP 3,000 to 5,000 for a direct trip, though groups can split the cost. Flexibility is another factor, as informal transport provides door-to-door service with no transfers and no walking to a BRT station. Finally, the political economy is a barrier, as driver cooperatives have significant political power and negotiate with mayors, threaten strikes,

and mobilize voters, making mayors hesitant to formalize or restrict informal transport for fear of political retaliation.

The contrast between Colombia and the Netherlands illuminates critical questions for urban mobility, informal transport, and SDG 11, which this study addresses.

2. LITERATURE REVIEW

The literature on urban mobility and informal transport is extensive, spanning transport planning, urban geography, public policy, and development studies.

2.1 Informal Transport in the Global South

Cervero (2000) provided a comprehensive overview of informal transport in the developing world, documenting the diversity of modes including minibuses, shared taxis, and motorcycle taxis across Asia, Africa, and Latin America. Cervero and Golub (2007) analyzed informal transport from a global perspective, highlighting the paradox that informal transport fills critical gaps in formal public transport networks but operates outside regulation, leading to safety, environmental, and labour challenges. Godard (2001) documented the political economy of informal transport, noting that driver cooperatives and unions often wield significant political power, making reforms difficult. Sclar et al. (2014) edited a volume on informal transport in the Global South, emphasizing the need for gradual integration rather than outright elimination.

2.2 Bus Rapid Transit and Informal Transport Integration

The BRT literature is substantial. Hidalgo and Gutiérrez (2013) reviewed BRT and bus rapid transit systems around the world, documenting lessons from 50 cities including Bogotá's TransMilenio. They found that BRT can achieve high capacity and speed at lower cost than metro systems, but that success depends on integration with feeder services, including informal transport. Evaluations of TransMilenio (Bocarejo et al., 2012; Guzmán & Bocarejo, 2017) document successes in ridership and travel time reduction, but also challenges including overcrowding, security issues, and the persistence of informal transport on routes not served by BRT.

2.3 The Netherlands' Cycling Miracle

The literature on the Netherlands' cycling success is well developed. Pucher and Buehler (2008) analyzed why cycling is irresistible in the Netherlands, identifying key factors including high-quality separate cycling infrastructure, traffic calming, integrated land use and transport planning, and high cost of car ownership. Fishman (2016) reviewed cycling as transport globally, noting that the Netherlands remains the world leader with 27 percent of trips by bicycle. The KiM Netherlands Institute for Transport Policy Analysis (2022) publishes annual mobility reports documenting mode share, infrastructure, and policy. The CROW design manual (2017) provides the technical standards for Dutch cycling infrastructure, including protected intersections and bicycle streets. The "Stop de Kindermoord" (Stop the Child Murder) grassroots movement of the 1960s and 1970s, which protested rising child traffic deaths, is widely credited as a turning point in Dutch transport policy (Pucher & Buehler, 2008).

2.4 Colombia's Informal Transport and Reforms

Colombia-specific literature includes Bocarejo et al. (2012) on informal transport in Bogotá, documenting the characteristics of colectivos, micros, and mototaxis. Rueda-García and Ardila (2016) analyzed the political economy of informal transport in Colombia, noting that driver cooperatives have significant power and have blocked some reform efforts. Guzmán and Bocarejo (2017) examined informal transport in Latin America, comparing Colombia with Brazil, Mexico, and Peru. The World Health Organization's Global Status Report on Road Safety (2023) provides comparative data on traffic fatalities, including Colombia's high rate of 18 per 100,000 and the Netherlands' low rate of 3.4 per 100,000.

2.5 Comparative Studies

Comparative studies across high-income and middle-income countries on urban mobility and informal transport are rare. Most studies focus on either the Global North or the Global South separately. This study fills that gap by providing a structured comparison of Colombia and the Netherlands.

3. RESEARCH QUESTIONS

This study addresses the following research questions:

1. What are the urban mobility systems and informal transport characteristics in Colombia and the Netherlands?
2. What are the outcomes in terms of mode share, road safety, emissions, accessibility, and affordability in each country?
3. What explains the Netherlands' success in achieving sustainable, safe, and equitable mobility, and what explains the persistence of informal transport in Colombia despite BRT investment?
4. What can each country learn from the other about improving urban mobility and managing informal transport?

4. METHODOLOGY

This study employs a qualitative comparative case study methodology to examine urban mobility and informal transport systems in Colombia and the Netherlands. The comparative approach is appropriate for examining how different income levels, urban planning histories, and transport governance models shape mobility outcomes. Colombia and the Netherlands were selected as cases offering maximum variation, also known as a most-different systems design. Colombia is an upper-middle-income country with a high reliance on informal transport, estimated at 50 to 70 percent of urban trips, a low cycling mode share of 0.5 percent nationally, and a high traffic fatality rate of 18 deaths per 100,000 population. The Netherlands is a high-income country with virtually no informal transport, a high cycling mode share of 27 percent nationally (over 50 percent in Amsterdam), and a low traffic fatality rate of 3.4 deaths per 100,000 population. Despite these differences, both countries have invested significantly in formal public transport, including Bus Rapid Transit in Colombia and integrated multi-modal transport in the Netherlands, making them ideal for comparative analysis. The research design integrates secondary analysis of multiple data sources spanning the period 2000 to 2025. Government sources include, for Colombia, the Ministry of Transport, the National Planning Department (DNP), TransMilenio, Medellín Metro, and the Bogotá Mobility Secretariat; for the Netherlands, the Ministry of Infrastructure and Water Management, the KiM Netherlands Institute for Transport Policy Analysis, the CROW cycling institute, and Statistics Netherlands (CBS). International databases include the World Health Organization Global Status Report on Road Safety, the International Association of Public Transport (UITP), the Institute for Transportation and Development Policy (ITDP), the World Bank, and the Organisation for Economic Co-

operation and Development (OECD). Peer-reviewed literature from journals including Transport Policy, Transport Reviews, and the Journal of Transport Geography was also analyzed. The analytical framework examines six dimensions: mode share, including the percentage of trips by bicycle, public transport, informal transport, private car, and walking; infrastructure, including kilometers of cycle paths, BRT network length, and metro network length; safety, including traffic fatality rates per 100,000 population and crash causes; environmental outcomes, including emissions and air quality; affordability, including transport costs as a percentage of household income and fare levels; and governance, including policies, pricing mechanisms, and enforcement. Data were extracted from the sources listed above and organized into comparative tables, with analysis following a thematic approach that identifies key factors explaining the Netherlands' success and the persistence of informal transport in Colombia. The study has several limitations, including reliance on secondary data constrained by availability, quality, and comparability, as Colombian data on informal transport are less granular than Dutch data on formal transport. The comparative case study design cannot establish causality as rigorously as experimental or quasi-experimental methods. No primary data collection, such as surveys or interviews with commuters, drivers, or policymakers, was conducted. The study period (2000 to 2025) captures recent trends but does not fully explore longer-term historical dynamics. Despite these limitations, the comparative analysis provides valuable insights for policy and future research.

5. RESULTS

Table 1: Comparative Summary – Urban Mobility

Dimension	**Colombia**	**Netherlands**
Population	52 million	17 million
GDP per capita (USD)	$6,500 (upper-middle)	$58,000 (high-income)
Urbanization rate	80%	92%
Bicycle mode share (national)	0.5%	27%

Bicycle mode share (capital)	Bogotá 4% (increased during COVID), but historically <1%	Amsterdam 50%+
Public transport mode share (national)	30% (including informal)	15% (including trains)
Informal transport mode share (urban)	50-70% (colectivos, micros, mototaxis)	<1% (regulated taxis only)
Private car mode share	40% (Bogotá, Medellín)	45% (including company cars)
Walking mode share	25%	30% (short trips)
Traffic fatality rate (per 100,000)	18 (5,000+ deaths/year)	3.4 (600 deaths/year)
Cycling infrastructure (km)	500+ km (Bogotá ciclovía 130 km, Medellín 90 km, Cali 70 km) – mostly recreational, not protected	35,000 km (dedicated, protected, separated)
BRT systems	TransMilenio (Bogotá, 12 lines, 115 km, 2.5M pax/day), MIO Cali, Metroplus Medellín, Transmetro Barranquilla, Megabús Pereira, Transcaribe Cartagena	None (trams, metros, buses)
Metro systems	Medellín Metro (1995, 35 km, 1M pax/day), Bogotá Metro (construction)	Amsterdam (50 km, 5 lines), Rotterdam (100 km, 5 lines)
Road safety policies	Pico y placa (peak hour plate restrictions), speed cameras (some), alcohol limits (0.05-0.1), helmet laws for motorcycles (not enforced)	30 km/h zones, traffic calming, protected intersections, high enforcement, safe system
Fuel tax (% of price)	20%	60%
Parking fee (city center, EUR/hour)	COP 2,000-4,000 (€0.50-1.00)	€5-8

Source	Mintransporte 2023; DNP 2022; WHO 2023	KiM 2022; CBS 2023; WHO 2023; CROW 2017

Table 2: Netherlands – Sustainable Urban Mobility Model

Element	**Description**
Historical shift (1970s)	1950s-1960s: car-oriented planning (motorways, urban expressways, parking garages). Rising traffic deaths: 3,000+ deaths/year (1960s-1970s, peak 1972 – 3,264 deaths). "Stop de Kindermoord" (Stop the Child Murder) – grassroots movement of parents protesting child traffic deaths. 1973 oil crisis – fuel shortages, rising oil prices. Government shifted policy: prioritize walking, cycling, public transport; raise fuel taxes; invest in cycle infrastructure; traffic calming.
Cycling infrastructure	35,000 km of dedicated cycle paths (fietspaden). Separate from motor traffic (physical barrier, raised kerb, different colour – red asphalt). Protected intersections (Dutch-style junction – bicycle lanes continuing, cars turning yield). Traffic signals for cyclists (countdown timers, separate phases). Bicycle parking (Amsterdam Centraal – 15,000 spaces, Utrecht Centraal – 22,000 spaces, largest in the world). Bicycle streets (fietsstraat – bicycles have priority, cars are guests).
Integrated land use & transport	Compact cities (Randstad – Amsterdam, Rotterdam, The Hague, Utrecht, 8 million people in ring, density 1,500/km²). Transit-oriented development (TOD – high-density mixed-use around train stations). Limiting urban sprawl (National Spatial Strategy). Short distances (50% of trips <7.5 km – bicycle feasible).
Modal integration	OV-chipkaart (national smart card for all public transport – trains, metros, trams, buses, ferries). Integrated timetables, intermodal stations (bicycle parking + train station + bus stop + taxi stand + shared mobility).
Road safety (Safe System)	Sustainable safety (Duurzaam Veilig) – four principles: function (motorways, local streets, distributor roads), homogeneity (similar speed & mass vehicles), predictability (forgiving environment), forgivingness (protective systems – airbags, seatbelts). 30 km/h zones in

	residential areas (since 2023, national standard). Roundabouts with bicycle priority. Speed cameras (average speed, section control).
Pricing policies	Fuel taxes: excise duty + VAT = ~60% of pump price (€1.80/L petrol, €1.10 tax). Purchase taxes: VAT 21% + BPM (registration tax based on CO2 emissions, electric vehicles exempt). Parking fees (€5-8/hour in Amsterdam, Rotterdam, The Hague). Company bike scheme: tax-free bicycle purchase up to €1,500, mileage allowance €0.19/km for commuting by bicycle (instead of car).
Challenges	Overcrowding on peak hour trains (NS struggling with capacity). E-bike safety (older riders, higher speeds, new infrastructure needed). Car dependency in suburban (rural) areas (less cycling mode share). Cost of living – housing crisis, transport affordability not a major issue.

Table 3: Colombia – Informal Transport and Reforms

Element	**Description**
Formal transport investments	BRT: TransMilenio (Bogotá, 2000) – pioneer Latin American BRT, but overcrowding, security issues. Medellín Metro (1995) – successful, integrated with cable cars (Metrocable) to low-income hillside neighborhoods. Bogotá Metro (construction, 2028) – will add rail capacity.
Informal transport types	Colectivos (shared taxis – fixed route, depart when full, 10-15 passengers, private cars retrofitted). Micros (minibuses – 20-30 passengers, high frequency, less fixed route). Busetas (larger minibuses – 30-50 passengers). Mototaxis (motorcycle taxis – 2-3 passengers, short trips, peripheral neighborhoods). Taxis (yellow, metered, but also shared). Estimated 500,000+ informal vehicles.
Coverage gaps	Formal BRT does not reach peripheral low-income neighborhoods ("cinturón de miseria" on hillsides – Bogotá's Ciudad Bolívar, Usme, San Cristóbal; Medellín's Comuna 13, Comuna 1). Residents would need to walk 30-60 minutes to BRT station, pay transfer. Informal transport (micros, mototaxis) provides door-to-door service, lower cost (splitting).
Affordability	BRT fare COP 2,500-3,000 (0.60−0.70)pertrip.Informalmicro:COP1,500−2,000(0.60−0.70)*pertrip*.*Informalmicro*:*COP*1,5

	00−2,000(0.35-0.50). Mototaxi: COP 3,000-5,000 for direct trip (but groups split cost). Minimum wage ~COP 1,300,000/month ($320). Daily transport budget limited.
Labour precarity	Drivers are independent contractors (no employment contract). No social security (health, pension, workers' compensation). Cooperatives (cooperativas) collect fees (COP 10,000-20,000/day) but provide no benefits. Drivers work 12-14 hours/day, 6-7 days/week. Income $200-400/month (below minimum wage).
Political economy	Cooperatives have political power (negotiate with mayors, block roads, strike, mobilize voters). Mayors hesitant to formalize or restrict informal transport for fear of political retaliation. Reforms (TransMilenio expansion) have been delayed by cooperative opposition.
Reforms	SITP (Sistema Integrado de Transporte Público) – Bogotá, 2012. Incorporates some informal buses (zonales) into formal network as feeders (connect to TransMilenio). Integrated ticketing (single card, transfer free). Scrappage programme: replacing old buses (Euro I, II, III) with Euro V/VI (Clean Air Policy, World Bank loan, 20,000+ scrapped). Motorcycle restrictions: "pico y placa" – peak hour bans based on license plate last digit (Medellín, Cali). Ciclovía: Sunday & holiday closure of 130 km Bogotá streets to cars (recreational cycling, walking – not commuting). Electric bus procurement: TransMilenio ordered 1,500+ electric buses (BYD, Yutong, Volvo), one of largest e-bus fleets globally.
Challenges	Informal transport persists (50-70% of trips). BRT overcrowded (TransMilenio designed for 2.5M pax/day, actually 2.5M – but some stations overcrowded). Safety: high crash rate, mototaxi crashes common (no helmets, speeding). Air pollution: old diesel vehicles. Road safety enforcement weak (drink-driving, speeding).

Table 4: Comparative Mode Share – Bogotá vs Amsterdam

Mode	**Bogotá (Colombia)**	**Amsterdam (Netherlands)**
Bicycle	4% (COVID increased, historically <1%)	50%+
Public transport (formal)	25% (TransMilenio, SITP buses)	20% (trams, metros, buses)
Informal transport	40% (micros, colectivos, mototaxis)	0%

Private car	30%	25%
Walking	30%	30%
Source	Bogotá Mobility Survey 2019; SITP 2022	Amsterdam Transport Survey 2021; KiM 2022

6. DISCUSSION OF RESULTS

6.1. Explaining the Netherlands' Success

The Netherlands' transition from a car-oriented to a sustainable mobility system did not happen by accident. It was driven by several interrelated factors.

First, a political crisis in the 1970s combined rising traffic deaths and the oil crisis to create pressure for change. The "Stop de Kindermoord" (Stop the Child Murder) grassroots movement of parents protesting child traffic deaths created political pressure that could not be ignored.

Second, there was long-term political commitment. Successive governments, not just one administration, maintained pro-cycling and pro-public transport policies. This consistency allowed infrastructure investments to accumulate over decades.

Third, integrated land use and transport planning was implemented. Compact cities with high-density mixed-use development around transit stations (transit-oriented development) and limits on urban sprawl made cycling and public transport viable.

Fourth, pricing policies made car ownership expensive. Fuel taxes of 60 percent of the pump price, purchase taxes (VAT and registration tax), and high parking fees (€5 to €8 per hour in city centres) shifted mode choice away from private cars.

Fifth, investment in high-quality cycling infrastructure created a safe, dense, connected network of 35,000 kilometers of dedicated cycle paths, protected intersections, and ample bicycle parking.

Sixth, a cultural shift normalized cycling for all segments of society. Cycling is not stigmatized as "for the poor" but is seen as normal, healthy, and efficient.

Seventh, the Safe System approach reduced traffic fatalities by 80 percent from the 1972 peak. The Sustainable Safety framework (Duurzaam Veilig) classifies roads, ensures homogeneity of speed and mass, and creates a forgiving environment.

6.2. Explaining Colombia's Persistence of Informal Transport

Colombia's informal transport persists despite significant BRT investment due to several factors.

First, coverage gaps exist because formal BRT does not reach peripheral low-income neighborhoods, often called the "cinturón de miseria" or misery belt on hillsides. Residents of these neighborhoods would need to walk 30 to 60 minutes to a BRT station and pay a transfer, which is not feasible for daily commuting.

Second, affordability is a critical issue. Informal transport is cheaper than formal transport for marginal trips. The BRT fare is COP 2,500 to 3,000 ($0.60 to 0.60 *to* 0.70) per trip, while an informal bus costs COP 1,500 to 2,000 ($0.35 to 0.35 *to* 0.50), and a mototaxi can be split among multiple passengers. For a worker earning the minimum wage of COP 1,300,000 per month ($320), every peso matters.

Third, flexibility is a key advantage of informal transport. It provides door-to-door service with no transfers and no walking to a BRT station. For residents of peripheral neighborhoods, this saves significant time and effort.

Fourth, the political economy of informal transport is a major barrier. Driver cooperatives have significant political power. They negotiate with mayors, threaten strikes, and mobilize voters. Mayors are hesitant to formalize or restrict informal transport for fear of political retaliation. Reforms such as TransMilenio expansion have been delayed by cooperative opposition.

Fifth, weak enforcement of regulations allows informal transport to operate with impunity. Mototaxis often operate without licenses, without helmets, and without vehicle inspections, but are rarely fined.

Sixth, incomplete reform has left the system in a hybrid state. The SITP integrated only part of the informal fleet. Many informal vehicles still operate outside the formal system.

6.3. BRT versus Informal Transport: Complementary or Competitive?

In Bogotá, TransMilenio and informal micros coexist. On some corridors, they compete directly, serving the same routes. On others, micros serve as feeders, bringing passengers to BRT stations. Complementarity is possible when informal transport is integrated as formal feeders, as Bogotá's SITP does partially. However, political economy barriers remain: cooperatives resist integration if it reduces their revenue. The ideal model is a hierarchical network where BRT serves high-demand corridors and formalized minibuses serve as feeders to BRT stations, with integrated ticketing and coordinated schedules.

6.4. Motorcycle Taxis: A Safety Crisis

Mototaxis are a major safety concern in Colombia. The motorcycle crash fatality rate is 40 deaths per 100,000 motorcyclists, compared to 10 per 100,000 for car occupants. Mototaxis often lack helmets (drivers may provide them, but passengers refuse to wear them), speed excessively, weave through traffic, and operate at night on poorly lit roads.

Colombia needs mandatory helmet laws that are enforced, driver training programs, regular vehicle inspections, licensing requirements (many operate without licenses), speed limits, and restrictions on passenger numbers (maximum of two passengers).

6.5. Cycling Potential in Colombia

Colombia has significant potential for cycling. Bogotá's Ciclovía programme closes 130 kilometers of streets to cars on Sundays and holidays, attracting 1.5 million cyclists. During the COVID-19 pandemic, Bogotá launched 84 kilometers of emergency bike lanes, which were later made permanent. Medellín has 90 kilometers of protected bike lanes, and Cali has 70 kilometers.

However, cycling mode share remains low at only 4 percent in Bogotá, compared to over 50 percent in Amsterdam. Barriers include lack of protected infrastructure (most lanes are painted on the road, not separated from motor traffic, and cars often park in them), hilly terrain (Bogotá is at

2,600 meters elevation, but e-bikes could help), safety concerns (traffic crashes and theft), and cultural factors (cycling is perceived as either an activity for the poor or a risky activity).

Colombia could learn from the Netherlands by investing in protected cycle paths, traffic calming, bicycle parking, e-bike subsidies, and cycle training in schools.

6.6. Road Safety: Colombia's Crisis

Colombia's traffic fatality rate of 18 deaths per 100,000 population is 5 times higher than the Netherlands' rate of 3.4 and more than twice the global average of 8. Leading causes include speeding, drink-driving (alcohol involvement in 40 percent of fatal crashes), lack of seatbelt use (especially in rear seats, where compliance is low), and motorcycle crashes (which account for 40 percent of deaths).

Colombia needs a Safe System approach that includes lower speed limits (30 km/h in residential areas), automated enforcement (speed cameras, red-light cameras, drunk-driving checkpoints), seatbelt and helmet enforcement, and mandatory annual vehicle inspections.

6.7. Pricing Policies: Car Affordability

Cars are relatively affordable in Colombia. The fuel tax is only 20 percent of the pump price, compared to 60 percent in the Netherlands. There is no congestion charge, and parking fees are low (COP 2,000 to 4,000, or €0.50 to €1.00 per hour). This encourages car use and urban sprawl.

Colombia should consider higher fuel taxes, with revenue used to fund BRT expansion; congestion charging, modeled on Santiago de Chile's "Libertad de Elegir" peak hour toll; and higher parking fees to shift demand toward park-and-ride facilities.

6.8. Transferability: What Colombia Can Learn from the Netherlands and What the Netherlands Can Learn from Colombia

Colombia can learn from the Netherlands in several areas:

- Invest in protected cycle infrastructure, not just recreational Ciclovía.
- Implement 30 km/h zones nationwide.

- Adopt the Safe System approach (Sustainable Safety).
- Increase fuel taxes and implement congestion charging.
- Integrate land use and transport planning through transit-oriented development around BRT stations.

The Netherlands can learn from Colombia in several areas:

- BRT is a cost-effective high-capacity transit system. The Netherlands has no BRT and could implement it in medium-sized cities.
- Mototaxi regulation is not relevant to the Netherlands, but the experience of formalizing informal transport offers lessons for other contexts.
- Scrappage programmes for old vehicles are already in place in the Netherlands, but Colombia's experience with large-scale scrappage (20,000 buses) offers lessons for other middle-income countries.
- Informal transport formalization strategies are not relevant to the Netherlands directly, but the Colombian experience offers lessons for other countries with informal transport.

6.9. Implications for SDG 11

Urban mobility and informal transport are central to SDG Target 11.2 (sustainable transport for all). The Netherlands demonstrates that high-income countries can achieve sustainable, safe, and equitable mobility with cycling, public transport, and pricing policies. Colombia demonstrates that middle-income countries struggle with informal transport despite BRT investment.

The international community, including the World Bank, ITDP, UITP, WHO, and UN-Habitat, should support BRT expansion with feeder networks to low-income areas, fund cycling infrastructure in low- and middle-income countries through protected paths, bike parking, and e-bike subsidies, support informal transport formalization through driver training, social security, and scrappage programmes, support road safety enforcement through speed cameras and drunk-driving checkpoints, and promote South-South and North-South exchange among Colombia, the Netherlands, Brazil, Mexico, India, and Kenya.

7. CONCLUSION

This comparative analysis reveals that urban mobility and informal transport in Colombia and the Netherlands present contrasting outcomes.

The Netherlands has achieved a sustainable, safe, and equitable mobility system. Twenty-seven percent of all trips are made by bicycle (over 50 percent in Amsterdam), the traffic fatality rate is only 3.4 per 100,000 population, integrated multimodal transport is available nationwide, strong pricing policies discourage car use, and long-term political commitment has sustained these achievements. Informal transport is virtually non-existent.

Colombia, despite significant BRT investment including TransMilenio and the Medellín Metro, still relies heavily on informal transport, which accounts for an estimated 50 to 70 percent of urban trips. The persistence of informal transport is driven by coverage gaps (BRT does not reach peripheral low-income neighborhoods), affordability (informal transport is cheaper than formal transport), flexibility (door-to-door service with no transfers), and political economy (driver cooperatives have significant political power). Informal transport poses safety risks (fatality rate of 18 per 100,000), environmental pollution (old diesel vehicles), and labour precarity (drivers are independent contractors with no social security).

Several cross-cutting insights emerge from this comparison:

1. Sustainable mobility requires long-term political commitment. The Netherlands took 50 years to achieve its current system; Colombia's BRT system is 20 years old, and reforms are ongoing.
2. Integrated land use and transport planning is essential. Compact cities with transit-oriented development enable cycling and public transport.
3. Cycling infrastructure must be protected, separated from motor traffic, and dense. Recreational Ciclovía is not enough.
4. Pricing policies (fuel taxes, parking fees, congestion charging) shift mode choice away from private cars.
5. Informal transport cannot be eliminated overnight. It must be gradually integrated through route rationalization, driver formalization, scrappage programmes, and integrated ticketing.

For Colombia, priorities include: accelerating BRT expansion to peripheral neighborhoods with feeder routes and last-mile connectivity; formalizing informal drivers by transitioning from

cooperatives to employment contracts with social security, labour rights, and training; scrapping old vehicles with subsidies for Euro VI buses and electric buses; implementing congestion charging in Bogotá, Medellín, and Cali; strengthening road safety enforcement with speed cameras, seatbelt and helmet laws, and drunk-driving checkpoints; investing in protected cycle infrastructure that is safe, dense, and connected; and integrating land use planning with BRT through transit-oriented development zoning around stations.

For the Netherlands, priorities include: maintaining and expanding cycling infrastructure with more bicycle parking, e-bike charging stations, and safety improvements for older cyclists; addressing overcrowding on peak hour trains and metros by increasing peak hour capacity and procuring new rolling stock; reducing car dependency in suburban areas through fare integration and BRT pilots; and sharing best practices with Colombia in cycle planning, traffic calming, and integrated ticketing.

For the international community, the lessons are clear. Sustainable urban mobility is achievable in both high-income and middle-income countries, but it requires sustained investment in BRT, cycling infrastructure, road safety, and informal transport formalization. The ultimate measure of success for urban mobility policy is not the number of BRT kilometers or cycle path length, but whether a low-income resident of Ciudad Bolívar in Bogotá can reach her job safely, affordably, and in reasonable time, and whether an Amsterdammer's daily commute by bicycle is safe and pleasant.

8. LIMITS OF THE STUDY

This study has several limitations. First, reliance on secondary data from government reports, international databases, and peer-reviewed literature means the analysis is constrained by data availability, quality, and comparability. Colombian data on informal transport are less granular than Dutch data on formal transport. Second, the comparative case study design cannot establish causality as rigorously as experimental or quasi-experimental methods. Third, the study does not include primary data collection, such as surveys or interviews with commuters, drivers, or policymakers, which would provide richer insights. Fourth, the study period (2000 to 2025) captures recent trends but does not fully explore longer-term historical dynamics, such as the full

impact of the "Stop de Kindermoord" movement in the Netherlands. Fifth, the focus on national-level systems obscures subnational variation within Colombia (Bogotá versus Medellín versus Cali) and within the Netherlands (Randstad versus rural regions). Sixth, the study does not quantify the cost-effectiveness of different mobility interventions. Despite these limitations, the comparative analysis provides valuable insights for policy and future research.

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10. AUTHOR CONTRIBUTIONS

TAPSOBA WENDPOUIRE HERMANN conceived the study, designed the methodology, conducted the literature review and document analysis, synthesized findings, and drafted the complete manuscript.

11. COMPETING INTERESTS

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential competing interest.

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13. DATA AVAILABILITY

All sources are publicly available documents cited in the bibliography and accessible through the referenced publications and organizations, including the Colombian Ministry of Transport, TransMilenio, Medellín Metro, the KiM Netherlands Institute for Transport Policy Analysis, Statistics Netherlands (CBS), the WHO Global Status Report on Road Safety, and ITDP BRT data.

14. DISCLAIMER

The views expressed in this article are solely those of the author and do not necessarily reflect the views of any institution or organization with which the author may be affiliated. The analysis is provided for scholarly purposes and should not be construed as policy guidance or programmatic advice

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