Policy options, Economic instruments and Financing Sustainable Urban Transport

Shritu Shrestha, Wuppertal Institute for Climate, Environment and Energy
Low carbon mobility solutions

Avoid-Shift-Improve approach

No travel Activity
- No desire or need to travel

Active Transport
- Walking, cycling

Public motorized Transport
- Public transport (bus, rail)

Individual motorized Transport
- Car, taxi, motorcycle

Avoid
- Avoid or reduce travel or the need to travel

Shift
- Shift to more energy efficient modes

Improve
- Improve efficiency through vehicle technology

Source: Bongardt et. al. 2019
Low carbon mobility solutions

Avoid: Compact cities and mixed use

**POTENTIAL IMPACT**
Potential to reduce energy consumption by 10–30%

**POTENTIAL CO-BENEFIT**
Reduced travel times
Public Health
Safety and more equitable access

**Road User Charging**
London’s congestion charging
- 25% CO2 reduction
- Travel time reduction
- Social costs reduction: EUR 144 million/year
- Funds are re-invested in e.g. public transport

Image: mariordo59/ flickr/ CC BY-SA 2.0
Low carbon mobility solutions

Shift to more energy efficient modes

POTENTIAL IMPACT

Potential for energy efficiency varies greatly, 10 – 30%

POTENTIAL CO-BENEFIT

Reduced urban congestion
More equitable access

Bus Rapid Transit

Trans Milenio Bogotá, Columbia
- Reduction of CO₂ emissions by 500,000 tons (in 3 years)
- Rationalized bus system, 32% commuting time reduction
- Access for disabled and poor
- 90% lower accidents in BRT systems
- Air quality improvements

Image: Claudio Olivares Medina/flickr/CC-BY-NC-ND 2.0
Low carbon mobility solutions

Improve: Fuel switch and intensity

**POTENTIAL IMPACT**

Increased efficiency 40-60% by 2030 feasible at low or negative costs
Changing the structure of the energy consumption

**POTENTIAL CO-BENEFIT**

Diversification of fuels used
Contributes to climate, air quality and/or energy security objectives

Fuel switch options for public vehicles
- Public Transport fuels switch e.g. hybrid/electric bus
- Medium to high potential for CO$_2$ savings
- Emission reductions (greenhouse gas and air pollutants)
- CO$_2$ emission reduction potential depends on the electricity mix
- SO$_2$, NO$_x$ emissions will be reduced significantly if switched to hybrid/electric
Low carbon mobility: Benefits

Direct Benefits
- Saving USD 50-100 trillion
- Reduced vehicle purchase
- Fuel costs

Indirect Benefits
- Synergies with key policy objectives
- Air Quality
- Safety
- Travel time
- Health improvements
Low Carbon mobility solutions: Implementation

Challenges

- Regulatory issues
- Institutional coordination
- Land ownership
- Lack of finance
- Stakeholder engagement
- Communication/public opposition
- Politics
- Technology availability
- Technical knowledge gaps

E.g. Chanelling investments on National level:

- Define clear investment related targets and indicators in the national (urban) mobility policy strategy
- Avoid/reduce counter-productive measures such as subventions for private car use or fuel subsidies
- Engage with Ministry of Finance and other relevant government agencies!
Low Carbon mobility solutions: Implementation

Avoid-Shift-Improve: Policy Instruments

Avoid
Avoid or reduce travel or the need to travel

Shift
Shift to more energy efficient modes

Improve
Improve efficiency through vehicle technology

Planning Instruments
Land-use planning
Planning / providing for public transport and non-motorized modes

Regulatory Instruments
Norms and standards (emissions, safety), organisation (speed limits, parking, road space allocation, production processes)

Economic Instruments
Fuel taxes, road pricing, subsidies, purchase taxes, fees and levies, emissions trading

Information Instruments
Public awareness campaigns, mobility management, marketing schemes, co-operative agreements, eco-driving schemes

Investment Instruments
Fuel improvement, cleaner technologies, end-of-pipe control devices, cleaner production

Source: Bongardt et. al. 2019
# Low Carbon mobility solutions: Implementation

## Example:

<table>
<thead>
<tr>
<th>Country</th>
<th>Energy sources</th>
<th>National policy ’supporting‘ SUM</th>
<th>Local policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>-RE 80%, majority from Hydropower - No fossil fuel reserve</td>
<td>-NDC: 20% of EV share and 50% decrease fuel dependency by 2050 -Reduced EV customs tariffs on import -80% EV bank loan</td>
<td>Lalitpur municipality has plan for EV promotion (Kathmandu)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>-RE less than 10%, Hydropower 37.6% of RE</td>
<td>-Plan to increase public transport share from below 10% to 30% by 2020 -No clear policy to encourage electric vehicles</td>
<td>Ban on fossil fuelled motorbikes by 2030 (Hanoi)</td>
</tr>
<tr>
<td>Philippines</td>
<td>RE 26%</td>
<td>-Alternative Fuels and Energy Technologies Roadmap 2017-2040 - Tricycle modernization program by Department of Transportation (DOTr)</td>
<td>Pasig E-Trike Program (2019)</td>
</tr>
</tbody>
</table>
Low Carbon mobility solutions: Implementation

- Stakeholder dialogue
- Coalition building
- Identification of potential synergies
- Consideration of wider benefits
- Support for complementary measures
- Linkages between policy and infrastructure

Technical Cooperation

Financial Cooperation

Bogota
Low Carbon mobility solutions: Implementation

Risk of isolated measure

Rebound Effect
12-32% for road transport due to isolated policy measures implementation

Uncertainty of a policy’s cost-effectiveness and its effect on energy efficiency

E.g. Fuel efficiency standards for vehicles improve overall fleet but induce additional travel as fuel cost saved (rebound effect) added fuel tax drive efficiently

Integrated policy measures

Modal shifts
Non-motorized transport and public transit services

National measures
Fuel pricing, vehicle fuel efficiency regulation, taxation

Transport and land use planning

Benefits
More compact, mixed and better connected communities
Less need to travel
Reduced rebound effect
Effectiveness!
Overall aim for Sustainable Mobility

- To create an equitable, affordable, safe, environmentally-friendly and an integrated transport system
- It is essential to get the priority right
- Proper priority leads to putting money where the need is
True costs of transport

Direct costs
- Time for travel
- Operating costs
- Fares

Indirect Costs
- Infrastructure
- Health
- Environment
- Air Pollution
- Congestion
- Urban Space

Who pays them?

Source: Kodukula 2018
True costs of transport

Example:

8-year TCO calculation, daily distance travelled of 250km, excluding driver costs, in 2018, in Europe (€/km)

Figure: Total cost of ownership (TCO) comparison of e-buses and diesel buses (source: Transport & Environment 2018)
Financing gap

Gap between local needs and the available financial resources

- Car-orientated investment
- Poor provisions for pedestrians and cyclists
- Lack of resources for high quality public transport system

Sustainable Urban Transport

Source: Breithaupt n.d.
Financing Gap

Transforming the urban mobility system requires financing

For infrastructure and procurement
• Requires high amounts over a short- to medium time period

For operation and maintenance
• Requires a continuous flow of relatively smaller amounts
Challenge related to innovative financing

- Lack of awareness of alternative finance options
- Lack of legal and technical expertise and capacities
- Tight municipal budgets and political resistance against the implementation of revenue streams
- Ensuring the bankability of projects, i.e. the willingness of lenders to finance a project.
  - Public funding programmes or guarantees can complement external financing and make a project bankable
Options to close the Financing Gap

• Redirect existing funding and financing streams
• Exploit new sources of financing
• Tap national / international support programmes
• Reduce the direct costs for public budgets and engage private sector

Major Actors
• National and regional government
• City authority
• Citizens
• Private sectors /Industry/ SME
• Donors and International organisations
Funding vs. Financing

**Funding**
- Financial resources or income which will support the project, **usually grants**
- **Usually from public budgets.** Funding is free of charge and providers do not expect to be repaid.

**Financing**
- Raising money for a project from revenue streams or **external sources such as private investors or banks** Involves borrowing capital (as a loan).
- Providers of financing **expect the repayment**, including an interest component or a concession agreement for a defined period of time.
Overview: Funding and Financing Sources

Project / measure (e.g. PT service; new tramline)

Increase public budget

- Internat. & bi-lateral funding
- National funding
- Local revenues
- external finance

Reduce (direct) costs of projects & services for public budget

- private sector involvement

- Municipal & Green bonds
- Development charges and value capture
- Pricing measures for car use
- Project related income

Source: Werland / Rudolph 2019
Funding & Financing: International Sources

Loan, Guarantees, Grants, Technical assistance, Co-financing including trust funds etc.

Mutilateral
• E.g. Green Climate Fund (GCF), Asian Development Bank (ABD), Global Environment Facility (GEF), NAMA Facility

Bilateral
• E.g. German International Climate Initiative (IKI), Japanese Hatoyama Initiative, KOICA

Climate-focused int. funds and institutions
• E.g. Clean Development Mechanism (CDM)

International climate funding facilities cannot replace solid sector financing. Nevertheless **funds & mechanisms** can facilitate **and support a switch towards sustainable transport.**
Funding & Financing: International Sources

Climate Financing and Sustainable Transport

Source: Gota and SLoCAT (2017)
Funding & Financing: National Sources

National Government Urban Transport Funding

- General taxation
- Transport Taxes – Fuel Duty
- Transport Taxes – Road User Fund
- Transport Taxes – Vehicle Registration

National Government Revenue Sources

Photos by Antonio Reséndiz on Unsplash

Photos by Fabrizio Verrecchia on Unsplash

Photos by Joyce Romero on Unsplash
Funding & Financing: National Sources

Fuel taxes and Surcharges

- Levied by governments, additional fuel surcharges by provinces of cities
- Characteristics
  - Simple, cost-efficient and reliable way of charging
  - User-pay-principle
  - Political acceptability sometimes problematic, political pressure sometimes keep fuel price low

On global level 80-90% of all revenues derived from the transport sector are being raised from the fuel tax

E.g. Fuel Surcharge in Colombia
- Colombian cities have a 20% surcharge on gasoline sales is levied
- Half of Bogota’s surcharge revenues are for Bogota’s TransMilenio System
- Private vehicle owners finance one third of mass transport system

Source: Breithaupt n.d.
In the face of these uncertain future developments it seems particularly relevant for societies to build resilience against political disruption. In the past demonstrate that fuel price increases have the potential to exacerbate existing tensions and lead to social and economic disruptions.

Where is the money going?

Source: International Fuel Prices, 2016
Funding & Financing: National Sources

E.g.: The German National Electric Bus Funding Programme
• The German Federal Ministry of the Environment has created a 70 Million Euro fund to support the procurement of electric buses.
• The programme covers
  – up to 80% of the additional investment costs compared to conventional diesel fuelled buses
  – costs for charging infrastructure and other measures, e.g. training courses.

5 German cities: 3000 E-Buses by 2030
Vehicle Quotas: Shanghai Experience

- Limit number of new vehicles registered per month (approximately 7 – 8k)
- Conduct an auction to sell registration plates
- Highest paid for a plate was in 2013 about 14,500 USD
- Currently the cost of a number plate is between 20 – 30k RMB or 4,000 USD

1.92B USD in 2011 – 2012 from license plates and income used for public transport and subsidising travel for elderly

For more information: https://www.chinadaily.com.cn/china/2013-07/26/content_16839233.htm
Dutch Vehicle taxation

Zero emissions, Zero bpm payment

<table>
<thead>
<tr>
<th>The CO2 emission is higher than</th>
<th>but not more than</th>
<th>Calculate the tax for a petrol car as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1. deduct the value from column I from the CO2 emission of the car</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. multiply that sum by the amount in column IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. add to that sum the amount from column III</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 grams/km</td>
<td>76</td>
<td>€ 353</td>
<td>€ 2</td>
</tr>
<tr>
<td>76 grams/km</td>
<td>102</td>
<td>€ 505</td>
<td>€ 66</td>
</tr>
<tr>
<td>102 grams/km</td>
<td>150</td>
<td>€ 2,221</td>
<td>€ 145</td>
</tr>
<tr>
<td>150 grams/km</td>
<td>168</td>
<td>€ 9,181</td>
<td>€ 238</td>
</tr>
<tr>
<td>168 grams/km</td>
<td>-</td>
<td>€ 13,465</td>
<td>€ 475</td>
</tr>
</tbody>
</table>

Example: Diesel surcharge for car with CO₂ emission of 200 grams/km = (200 - 65) x € 86.69 = € 11,703.


Source: Kodukula 2018
Funding & Financing: National Sources

National government support for Local measures

• Direct allocation from government
  – Challenge – lack of transparency

• Ring fenced funding for specific programmes
  – Permits national government to influence direction of local policy intervention

• Competitive funding on specific policy based measures
  – Incentivises local government to develop schemes aligned to national government policy
Funding & Financing: National Sources

Discussion:

Which international, bi-lateral and national funding sources are you aware of?

Which do you use?

If not – why?
Funding & Financing: Local Sources

Local or city level options

- Project level income
- Parking pricing
- Congestion charging or Road Pricing
- Emission Free Zones
- Advertising and PPPs
- Land Value Capture
Funding & Financing: Local Sources

Project related income (e.g. from bus ticket)

- Keep public transport fares on a **moderate level** to ensure affordability and to attract passengers

- National / regional level **co-funding** for public transport

- Only available after service starts operation
  
  - Can cover a share of operating costs but not upfront investments for construction and procurement
Funding & Financing: Local Sources

Pricing private car use

- Congestion charges
- Parking fees

- Rationale: polluter / user pays principle
- Internalising external costs of motorised vehicle use
- Revenues can be ring-fenced for improving PT
- Can be used as transport demand management tool
Parking pricing

**Current state**
- On and off-street parking as widespread phenomenon
- Subsidising and undercharging of parking

**Consideration**
- Off-street parking should be cheaper than on-street parking
- Parking fee should be higher than a single bus/PT fare

Source: Breithaupt n.d.
Funding & Financing: Local Sources

Parking price vs Public transport

Funding & Financing: Local Sources

Illegal parking fine

Picture: Parking on brand new foopath along Ojijo Road in Parklands, Nairobi (Source: Chris Kost via Tweet 29th April 2019)
The Congestion Charge is an £11.50 daily charge for driving a vehicle within the charging zone between 07:00 and 18:30, Monday to Friday.
Funding & Financing: Local Sources

Road Pricing (General)

• If revenue for maintenance is the objective, heavy vehicles (i.e., trucks) should be charged more

• If alleviating congestion is the objective, the price during peak hours should be higher

• If reducing emissions is the objective, more polluting vehicles should be charged more

• Price differentiation is possible by location, time of day and vehicle type

Source: Kodukula 2018
## Funding & Financing: Local Sources

### Income from Congestion Charge

<table>
<thead>
<tr>
<th>c) Congestion charging</th>
<th>Group and Corporation 2017 £m</th>
<th>Group and Corporation 2016 £m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>249.6</td>
<td>258.4</td>
</tr>
<tr>
<td>Toll facilities and traffic management</td>
<td>(74.8)</td>
<td>(84.4)</td>
</tr>
<tr>
<td>Administration, support services and depreciation</td>
<td>(10.9)</td>
<td>(5.7)</td>
</tr>
<tr>
<td><strong>Net income from Congestion Charging</strong></td>
<td><strong>163.9</strong></td>
<td><strong>168.3</strong></td>
</tr>
</tbody>
</table>

The net revenues from the Congestion Charge are spent on improving transport in line with the Mayor’s Transport Strategy.
Emission Free Zones – E.g. Milan’s EcoPass

• Emissions-based charges for the entry into Milan’s Limited Traffic Zone (ZTL)

• Cameras record vehicle licence plate numbers, and debit the card holder’s account

• Operating Hours: Monday – Friday 7.30 a.m. to 7.30 p.m.

• Tollage up to EUR 10 per day - based on the Euro emissions class of the vehicle, the fuel type, the particulate filters, and the type of transport (personal or goods)

• There is an additional offer of a multiple access card (50 days of access, not consecutive, with a reduced price) and a subscription card for residents of the ZTL

EcoPass impacts

Traffic

19.2%

Travel Speed

11.3%

CO₂ Reduction

12%

Public Transport

9.7%

Source: Kodukula 2018
Funding & Financing: Local Sources

How to make pricing measures successful?

• **Inform the public** about the objective of the charging system and its intended impacts

• Make clear that *revenues will be reinvested into public transport* and other alternatives.

• Conduct a **trial** period to allow road users to accustom to the new system and its potential benefits, to **test alternative travel options**

• Stress the **role of the system** as component of a broader mobility strategy.

• Consider **concerns about equity and fairness**, e.g. exemptions for vehicles used by disabled people.
Funding & Financing: Local Sources

Land Value Capture

• Financing mechanism where land owners benefit from new public infrastructure

• Businesses value located near the new infrastructure can be increased

• Reduces the capital costs of public transport

• Promotes high density land use

• Transit Oriented Development (TOD)
Funding & Financing: Local Sources

E.g. Hongkong Rail Plus Property (R+P) model

• Metropolitan Transit Railway Corporation (MTRC) of Hong Kong
  – buys development rights from the Hong Kong Government (the majority shareholder of the MTRC) at a “before rail” price, and
  – sells these rights to developers at an “after rail” price—which is significantly higher.
  – The differential between the “before rail” and “after rail” prices covers the cost of railway investments.

• MTRC takes advantage of market-driven property appreciation to finance railway services.

Source: Kodukula 2018
**Funding & Financing: Local Sources**

**Advertising**

E.g.: Advertising on bus stops in London

- Contractual agreement between ‘Transport for London (TfL) and the outdoor specialists ‘Clear Channel’ (CC)
- CC owns the right to sell media space on half of TfL’s bus shelter portfolios
- CC in return runs the routine maintenance on design of street furniture
- All generated incomes are used for the London public transport network

*Source: Breithaupt n.d.*
Advertising

E.g.: Vélib in Paris

- **Bike-share system** funded by an **advertising partnership** with firm JCDecaux, covering all the costs for the Vélib system

- Initial 10 year **outdoor advertising contract**, allowing control advertising rights on 1628 bus shelters, newsstands, public toilets, and other street furnitures

- JCDecaux **paid** Paris city **all the revenue from cycle rentals and annual subscriptions**, plus an estimated **€3.5 million per year** from its advertising takings

Replicated in Spain, Turkey, Australia
Funding & Financing: Debt financing

Tax Increment Financing (TIF)

- Expected financial returns for financing a project, such as infrastructure development.

- **City borrows money to finance projects from a creditor**

- Debt repayments are covered from ring-fencing expected future additional tax revenues (e.g. real estate taxes) that would not occur if the project was not implemented
Funding & Financing: External finance

Debt financing: Green Municipal Bonds

• City governments issue (green) municipal bonds to finance transport infrastructure or services

• Repayments can be extended over a long time period.

• Interests will be paid from direct project related revenues (e.g. fares) and cost savings
Funding & Financing: Debt Financing

E.g.: The RATP green bonds programme

• The French state-owned public transport operator RATP launched a green bonds programme in 2017.

• RATP aimed at receiving € 500 million with a 10-years issue

• Used for renewal of rolling stock, upgrading of a metro line, and the purchase of electric locomotives. With € 1.6 billion of orders, the fond was three times oversubscribed.

Private Sector Engagement

Kinds of private sector engagement

• Broad spectrum of possible PPP models, from service contracts to full privatisation.

• 2 commonly used PPP models are:
  
  • **Build-Operate-Transfer (BOT):** private sector enterprise builds and operates the infrastructure for a defined period of time (e.g. 20 years). After that time the asset is reverted to the public sector.

  • **Build-Own-Operate (BOO):** a private enterprise develops and operates the project for a defined period of time. The public sector buys the asset at a predefined price or market price.
Funding & Financing: Private Sector Engagement

Two perspectives on private sector engagement

... increases the effectiveness of public services

... privatises short-term profits on the expense of service quality and working conditions

→ Achieving an ‘optimal’ degree of public sector engagement is a political decision

Photo by Sam Williams on Unsplash
Overview: Funding & Financing Options

International
- Bilateral
  - Funding & Support Programmes

National
- Funding & Support Programmes
  - Payments for the provision of local and regional public transport services
  - General municipal budget
  - Earmarked revenue from road charges, parking fees, value capture
  - (Green) municipal bonds
  - Loans
- Project related income: Public transport fares, advertisements, etc

Local
- PPP: Build-Operate-Transfer and Build-Own-Operate
- Voluntary Capture
- Integrate Private Service Provider

Private Sector

Construction and procurement

Operation and maintenance

Source: Werland / Rudolph 2019
Supporting Low Carbon Plans for Urban Basic Services in the context of the New Urban Agenda

www.urban-pathways.com
• **Objective:** Support low carbon plans for urban basic services and contribute to the implementation of the New Urban Agenda, Paris Agreement and the Sustainable Development Goals

• **Activities:** Capacity building, assessment at country/city level, city to city partnership, exchange good practices and standards, local implementation concepts (develop bankable projects)

• **Sectors:** Energy, Mobility and Resources

4 pilot + 16 replication cities in Africa, Asia and Latin America

www.urban-pathways.com
• Inform decision makers and stakeholders about the mitigation and sustainable development potential of sustainable urban infrastructure.

In the area of urban mobility the Urban Pathways project benefits from direct linkages to UEMI and FUTURE RADAR project.
• Capacity building and Change maker programme by bringing together all the stakeholders (policy makers, city officials, investors and implementation actors)

• City-to-city partnership

<table>
<thead>
<tr>
<th>Event</th>
<th>Location/Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoDistricts Webinar series (Spanish)</td>
<td>15 August 2018, 4 September 2018</td>
</tr>
<tr>
<td>Urban Pathways Training</td>
<td>Nairobi, Kenya, 6 - 7 September 2018</td>
</tr>
<tr>
<td>Low-carbon urban mobility Webinar series</td>
<td>13 September 2018, 6 November 2018</td>
</tr>
<tr>
<td>Transport &amp; Climate Change Week</td>
<td>Berlin, 24 - 28 September 2018</td>
</tr>
<tr>
<td>World Habitat Day Solid Waste Management</td>
<td>1 October 2018</td>
</tr>
<tr>
<td>Open Streets Workshop Cape Town</td>
<td>22 October 2018</td>
</tr>
<tr>
<td>Sustainable Mobility Training</td>
<td>Belo Horizonte, 5 - 6 November 2018</td>
</tr>
<tr>
<td>Planning the Cycling City Webinar Series</td>
<td>6 November 2018</td>
</tr>
<tr>
<td>COP 24 Training Events Katowice, Poland</td>
<td>3 - 14 December 2018</td>
</tr>
<tr>
<td>Active Mobility Planning Ibagué, Colombia</td>
<td>10 December 2018</td>
</tr>
<tr>
<td>Transit-Oriented Development Training Cuenca, Ecuador</td>
<td>10 January 2019</td>
</tr>
<tr>
<td>Cities Exchange Forum Quito, Ecuador</td>
<td>28 - 31 January 2019</td>
</tr>
</tbody>
</table>

www.urban-pathways.com
• Cities’ policy environment study, Project scoping in the partner cities and provide funding solutions

www.urban-pathways.com
Hai Phong, Vietnam: Pedestrian street along Tam bac River
Kochi, India: E-Tuk-Tuk
Kathmandu, Nepal: Upgrading E tuk-tuk ‘Safa tempo’

- Create synergies with other related projects
- Steps to Action activities in pilot and replication cities

Focal point: Hai Phong City
Focal point: Kochi municipality, KMRL and Kerala State Electricity Board
Focal Point: Sajha Yatayat

Budget: 100,000 Euros

www.urban-pathways.com
Belo Horizonte, Brazil:
Zone 30 and bike lanes

Quito, Ecuador:
EcoDistricts

Concept: BH and the city of Bremen
Focal Point: BH-Trans
Budget: 120,000 Euros

Focal point: Metropolitan Institute of Urban Planning (IMPU)
Budget: 200,000 Euros

www.urban-pathways.com
Kenya:
Solid Waste Management

Focal point: Nairobi County

Cape Town, South Africa:
Open Streets

Focal point: Open Streets (NGO)
In partnership with Transformative Urban Mobility Initiative (TUMI)

www.urban-pathways.com
Thank you!

shritu.shrestha@wupperinst.org
+49 30 2887458-18
Dr. Shritu Shrestha
Research Fellow
Research unit Mobility and International Cooperation
Wuppertal Institute for Climate, Environment and Energy